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TECHNICAL REPORT ECOM-0251-2

CORRELATION BANDWIDTH MEASUREMENTS OVER TROPOSCATTER PATHS

SECOND INTERIM REPORT

DISTRIBUTION STATEMENT

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Richard Branham - Arnfinn Manders

Dennis Kozakoff - Barbara Brummett

NOVEMBER 1969

ECOM

UNITED STATES ARMY ELECTRONICS COMMAND · FORT MONMOUTH, N.J.

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MARTIN MARIETTA CORPORATION

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TECHNICAL REPORT ECOM 0251-2
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For

U.S. ARMY ELECTRONICS COMMAND, FORT MONMOUTH, N.J.

CONTENTS

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ILLUSTRATIONS

I. PROGRAM OBJECTIVES

Project MALLARD is a program for the design and development of a digital, automatically switched communication system for the field Army with characteristics as described in the project MALLARD Quadripartite, Communications Plan, and Proposals for Research and Development. This digital system will be designed to transmit full duplex voice, teletype, facsimile, and digital data at various speeds with total traffic security. The communication links between points will use many different devices such as cable, microwave, radio, etc. as appropriate for the particular link. Troposcatter paths of 150 to 250 km nominal are to be used in areas where direct cable or simple microwave systems are not applicable.

The objective of this program is to obtain data necessary for the design of troposcatter modems for use in future MALLARD troposcatter systems. In support of this objective, propagation data are being collected over three types of troposcatter paths to empirically determine cross correlation versus frequency spacing and other fade statistics to provide a basis for the determination of the maximum bit rates that can be satisfactorily transmitted by frequency diversity methods with a stated error probability under known conditions of path length, path terrain, season, antenna size and beamwidth, radio frequency band, occupied bandwidth, radiated power, and frequency spacing. These data are also directly applicable to the prediction of space diversity maximum bit rates at stated error probabilities since the correlation bandwidth and fade statistics directly affect the error probabilities and bit rates obtainable.

The propagation data are being collected through the use of a fixed C- and X-band transmitting system located at the RADC troposcatter test site at Model City, New York. The receiving instrumentation is located in a special van that is moved to various locations to provide variations in terrain.

During the phase covered by the first interim report (Reference 1), a literature review on previously available data on correlation bandwidth was made. Later, these data will be combined with the field test data to form the basis to correlate bandwidth and other fade and propagation statistics in terms of identifiable parameters such as terrain, path length, weather, frequency, and beamwidth.

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II. SUMMARY

This second interim report on correlation bandwidth over troposcatter paths is concerned primarily with the data obtained during the first set of operations on each of the three paths. Some practical considerations are presented relative to the effects that are brought about by the stability of the atmosphere in the common volume. It appears that two mechanisms are contributing to the correlation bandwidth either singly or simultaneously. A computer study has been made to test the effect that the variables have on correlation bandwidth using the ray tracing technique introduced in the first interim report. Using temperature, humidity, pressure, and the distance between sites, it was found that these variables alone are not sufficient to describe the correlation bandwidth. The resulting computations appear to require only a scale factor to be correct. Work is continuing to perfect the model in so far as possible to predict correlation bandwidth with only surface measurable variables.

The field tests have been performed over the three paths in New York State plains region with the receiver instrumentation van located in Ontario Center for three weeks; Weedsport, N. Y., for three weeks; and Point Petre, Canada, for two weeks. This report is concerned primarily with the presentation of the reduced test data from the operation during this period.

The field data presented herein were inserted into the computer system on magnetic tape and were plotted by a computer controlled plotter. For this interim report the data are presented on a test by test basis so that the individual happenings on each test can be appraised and compared with other individual events. This enables the simultaneous events occurring at X and C-bands to be evaluated in all factors involving tropospheric propagation over the typical MALLARD links. The next interim report will contain the percentile plots of all variables.

The correlation bandwidth over troposcatter paths has been found to be anything but constant over these paths. It was found to vary significantly over a fifteen minute period from very wide to very narrow and vice versa. Fade rates are much more widespread over these paths than they were over the ECOM/Tobyhanna path in 1968 (Reference 2). Some of the high fade rates are due to aircraft, but most of them were due to propagation factors present in the New York/Lake Ontario area. Some ducting was noted at Ontario Center and at Point Petre. The signal levels at Whitford Field near Weedsport, N. Y., were usually very low and ducting was never noticed. An interesting finding in this program is that the use of X-band in place

of C-band resulted in very nearly the same degree of frequency diversity obtainable. At X-band, the fade rates were much higher than at C-band. As a result, adaptive frequency modems would have to be capable of coping with the fade rates which are twice that of C-band. Frequency-time modems are insensitive to fade rate and would also operate better in the high fade rate condition because the burst error occurances would be of shorter duration.

All technical instrumentation problems were solved through the efforts of RADC, ECOM, and Martin Marietta personnel. These ranged from routine maintenance and obtaining special test equipment to the replacement of the C-band transmitter equipment. One unsolvable problem, however, was the low signal strength at Whitford Field. The nearby trees caused the path to use a higher transmitter takeoff angle than originally calculated, hence there was about 10 to 15 dB greater loss in the path than was anticipated. The cross correlation data and fade rates obtained at the Whitford site were satisfactory, but the depth of fade and fade durations were often not reported due to lack of fade margin in the instrumentation. Nevertheless, sufficient data were obtained to evaluate the site in all variables.

III. FADE RATE-CORRELATION BANDWIDTH-STABILITY IN THE COMMON VOLUME

It was predicted in the first interim report that there would be two different propagation mechanisms in effect. When the air in the common volume is stable, layers will tend to occur. These layers will reflect the waves with relatively small multipath spread. When the air in the common volume is unstable, turbulence will occur. This results in incoherent scatter from a turbulent volume with a resulting greater multipath spread.

The experimental data confirm these conclusions. It can be shown that stability of the air in the common volume will, in addition to reducing the correlation bandwidth, also cause an increased fade rate. This conclusion is verified by the experimental data.

A. FADE RATE

Time selective fading (fading in the time domain) is caused by constructive and destructive interference by wavelets scattered by different scatterers as shown in Figure 1. The doppler shift imparted to a particular wavelet depends on the direction and magnitude of the velocity of the scatterer. Birkemeier (Reference 3) has shown that under certain conditions there is a relationship between the crosspath wind and fade rates. Under turbulent conditions this relationship usually does not exist since the velocity of the scatterers due to turbulence will be the dominant factor.

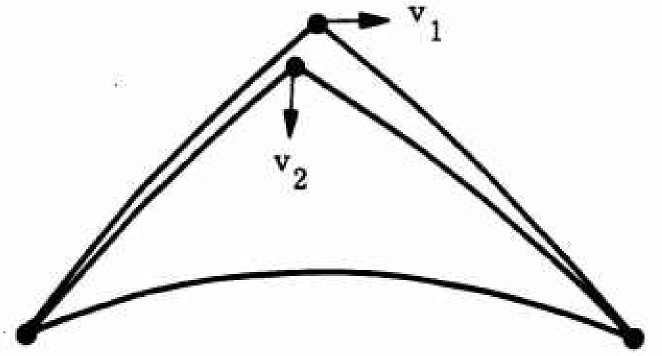


Figure 1. Two Path Model Illustrating the Origin of Time Selective Fading

There are thus at least two different mechanisms that lead to high fade rates. One is strong crosspath wind, another is turbulence in the common volume. Strong crosspath wind does not lead to decreased correlation bandwidth while turbulence in a common volume usually does. Therefore, care must be exercised in analyzing the data to spot the periods when the troposphere is turbulent.

B. STABILITY OF THE AIR IN THE COMMON VOLUME

The stability of the air within the common volume plays an important part in determining the correlation bandwidth of the troposcatter link. The correlation bandwidth under stable conditions can be evaluated as shown in Reference 1 from path parameters and gross meteorological parameters contributing to instability.

The reason for instability of the air in the common volume must be sought in the thermodynamics of the air in the layer from about 500 to 2000 meters above smooth earth level. When a small volume of air is raised it will undergo an adiabatic expansion. Work is required to make the air expand adiabatically.

As the air expands it cools off. If it were an ideal gas, this could go on indefinitely. However, since the air contains water vapor it will eventually reach a point where the temperature reaches the dew point of the mixture. Further rising of the air will cause an adiabatic expansion with condensation, a so-called pseudoadiabatic expansion. In this latter phase, energy is released. If, on balance, energy is released when a small volume of air is raised, the air is in an unstable condition.

Information to be used for estimating the stability of the atmosphere can be gained from sonde data of temperature and humidity as a function of pressure (altitude). For example, consider the pressure-temperature curve shown in Figure 2. The work required to lift a small volume of air from the 950 mb level where it will be at a temperature T_1 to the 850 mb level where it will be at the temperature T_4 can be estimated as follows:

Initially the air will expand adiabatically parallel to the adiabatic direction until it is saturated. This is the point M_2. From M_2 to the 850 mb level the air will expand pseudoadiabatically, i.e., with condensation. Thus the air will arrive at the 850 mb level at point M_3. The area between the P-T curve and the path $M_1M_2M_3M_4$, counting area on the right side of the curve as positive, represents the work required to move a small volume of air from the 950 mb level to the 850 mb level. If this work is positive, the atmosphere is stable; if it is negative, the atmosphere is unstable.

The method outlined in this section allows estimating the stability of the air in the common volume from detailed weather bureau reports. If one postulates a suitable thermodynamic model for the atmosphere it might be possible to obtain a fairly good estimate of the P-T curve from a sequence of ground based temperature measurements.

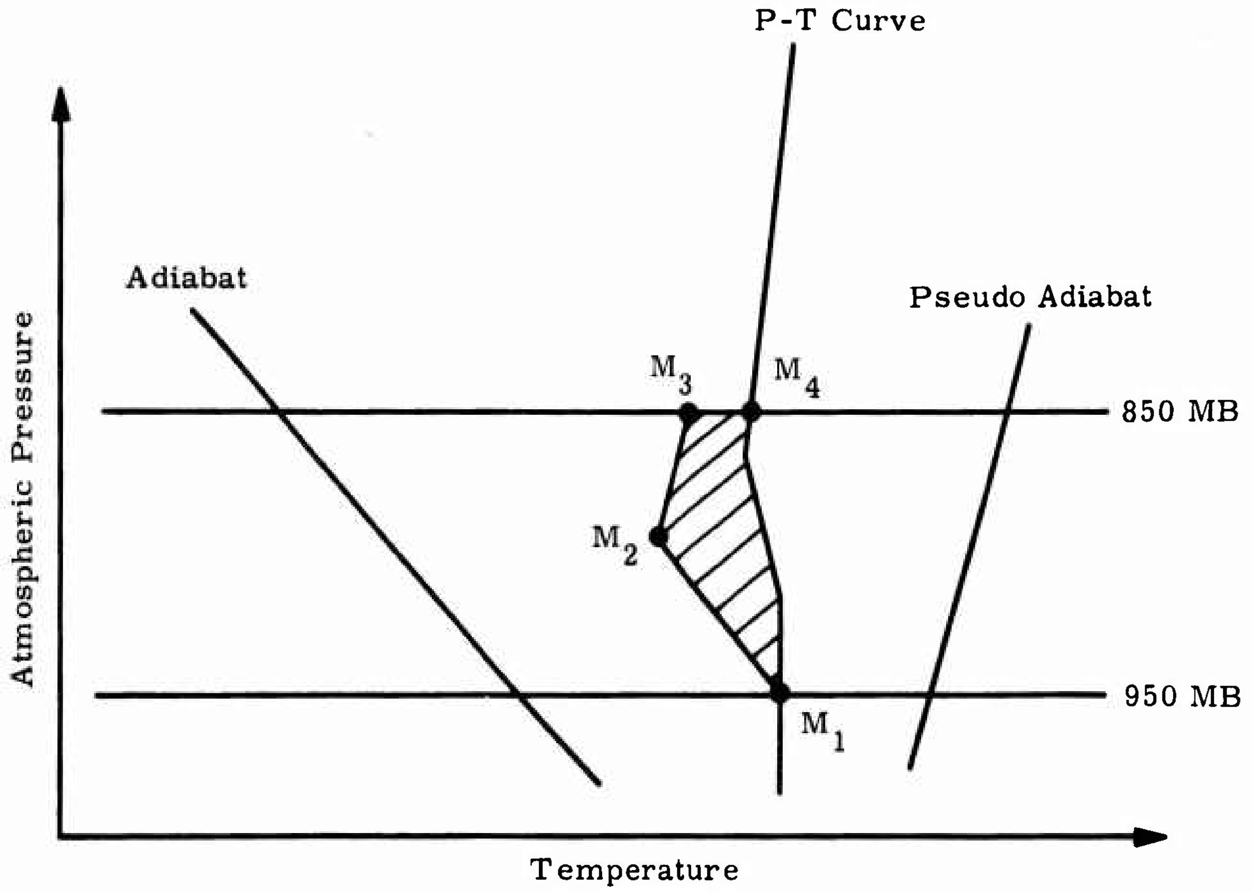


Figure 2. Pressure-Temperature Curve Used for Estimating the Stability of the Air in the Common Volume

C. CORRELATION FUNCTION COMPUTER STUDY

The ray trace computer code presented in the first interim report was modified extensively to model the predicted correlation function for a given troposcatter link. The modified computer program presented in detail in Appendix A of this report computes the surface meterorlogical conditions in the vicinity of the common volume. Subsequently, ray trace solutions for the upper and lower antenna beam edges based on antenna beamwidth and link geometry permits evaluation of the multipath spread, Δ, in microseconds. The Gaussian form of envelope correlation coefficient is then employed to numerically evaluate the function versus frequency separation in MHz.

A scale factor, SF, is employed in the correlation bandwidth model used in the computer program, and in general must be evaluated to get good agreement between the empirical and theoretical data. For instance as indicated in the first interim report, if $SF = 1.146\,\pi$,

good agreement between the Rice and Sunde envelope correlation function models result. Subsequently, prediction of the correlation function as based on the geometry can be obtained. While this model may particularly be good for the more isotropic scattering case, the model breaks down in that it does not account for change in the scattering mode such as due to turbulence within the common volume. Thus, since the scale factor, SF, can suitably be determined to get good curve fit between the theoretical and experimental data, it should be possible to then relate SF to other more important factors which account for large changes in the correlation bandwidth throughout the day. For instance, when the scattering mechanism is due principally to turbulence within the common volume which might occur for an unstable troposphere, it has been found that the correlation bandwidth is inversely related to fade rate. It is also known that fade rate at a given frequency increases with path length. In conclusion then, by careful correlation of the experimental data with meteorological conditions and the computer model, it should be possible to relate SF to other factors. This will be one of the objectives to be pursued during the next period and the results presented in the next interim report.

To illustrate this point the correlation bandwidth model was evaluated to compare with the Whitford C-band and X-band data taken on 29 August. The computer output for four cases selected is presented in Appendix A. For this selected example, Ns and the multipath spread as based on the geometry and weather conditions was almost identical for all, yet wide differences in the correlation bandwidths were observed. Curve fitting the theoretical curves with the experimental curves has determined that the following values of scale factor were necessary:

Time	Data	Correlation Bandwidth ($P_e = 0.4$)	Scale Factor, SF
1450	X-wide	1.3 MHz	3.34
1535	X-wide	3.0 MHz	1.45
1450	C-wide	1.2 MHz	3.61
1550	C-wide	2.7 MHz	1.61

The scale factor corresponding to the 1450 data was in both cases, in good agreement with that derived from the Sunde and Rice Models with SF = $1.146\,\pi$, and as such was directly related to the multipath spread. However, for the 1535 and 1550 data, the correlation bandwidth was over twice that for the 1450 data and could not be accounted for by the change in Ns as mentioned previously.

IV. REDUCED DATA

This report contains typical samples of the reduced data from the first round of the three paths. The transmitter is located at the RADC test site, Model City, N. Y., and the receiver sites are located at the RADC test site, Ontario Center, N. Y.; Whitford Field, Weedsport, N. Y.; and Point Petre, Ontario, Canada. The sites and path profiles are discussed at length in Reference 1.

The receiving instrumentation operated for a period of about three weeks at each site, recording signal strength versus time on magnetic tape. There were five signals for C and five signals for X band spaced so as to obtain cross correlation coefficient calculations every 1 MHz from 1 to 9 MHz. A special spacing of 200 kHz was used for the narrow spacing tests. This latter spacing was primarily used to determine the behavior of the cross correlation coefficient versus frequency at the origin. The middle channel of both types of measurements was used to calculate the fade statistics for each test.

The magnetic tapes were processed in the Martin automatic data reduction equipment (MADRE) and a CDC 6400 computer at the Martin Marietta Orlando facility. Five minutes of each C-band test and 2.5 minutes of each X-band test was reduced as a separate entity and the results plotted by a Calcomp automatic plotter. Each test was plotted for cross correlation coefficient and fade rate distribution. If available, the fade duration distributions, fade depth distributions, and signal amplitude distributions were plotted.

Generally, there were five plots made for each test, making the number of curves for the first round of testing enormous. All of these curves have not been included in this report; rather, representative plots are presented with discussions of each case.

In viewing the curves it is important that the wrong impression is not conveyed by the automatic plotter. The cross correlation coefficients are defined as unity at the origin of the curve versus frequency. As the pen moves to the next several points, a subroutine in the computer draws a smooth curve through the points. The derivative at the origin is expected to be zero, but the plotter cannot draw it as such without modifying the software. It therefore proceeds to create a non-zero derivative at the origin.

A typical test number can be interpreted as follows:

09 25 1118 06 W C

- C — C-band
- W — Wide frequency spacing
- 06 — Sixth test of the day
- 1118 — Test started at 1118
- 25 — The twenty fifth day of the month
- 09 — The ninth month

Other suffixes are:

NC Narrow C-band
WX Wide X-band
NX Narrow X-band

Included in Appendix B is a complete listing of all the test runs at all three sites. These lists contain the tests in numerical sequence with pertinent facts such as weather in the vicinity of the transmit and receive sites and the median signal strengths measured in dB below 1 mW. Unless otherwise stated the transmitter power for Ontario Center and Point Petre at X band is 1000 watts peak with a duty cycle of 0.20 per channel and at C band the power is 500 watts peak with the same duty cycle. At Whitford Field the X-band power is boosted to 1500 watts and the C-band power remained at 500 watts. The narrow spacing tests used FM with a modulation index of 1.841. The FM system therefore provides five significant lines of CW spectra separated by 200 kHz. The central line is 5 dB below the two adjacent lines, and the next two lines moving out from center is the same amplitude as the central line. The total power at C band is 500 and at X band is 1000 watts CW.

The signal generator calibration on the wide band tests uses a peak power in dBm with the signal generator pulsed at a 0.20 duty cycle. For the narrow band tests the calibration is by CW.

Appendix C contains a listing of the August-September weather for Rochester.

A. CROSS CORRELATION COEFFICIENTS

Correlation bandwidth data taken simultaneously on the X- and C-band frequencies have been observed to be less frequency dependent than was predicted in an earlier MALLARD troposcatter test program (Reference 2, page 103). The correlation bandwidths measured simultaneously on 13 August 1969 at Ontario Center result in very nearly the same curves test by test for both X and C bands (Figures 3 and 4). This observation appears to be representative of the most probable situation throughout the summer data. The data from the Whitford Field (Figures 5 and 6) also show this same trend. However, the overwater path to Point Petre does not exhibit the same correlation bandwidths for X and C bands to the same degree as the Ontario Center and the Whitford data. In Figures 7 and 8, test 1 shows X and C band to be the same, while in the other two tests, the C-band data are greater than the X-band data, which is contrary to the expected result. The tests on 17 September (Figures 9 and 10) show the X band as greater than the C band. The seven runs made on 23 September however show almost identical bandwidths for both frequencies (Figures 11 and 12). The Point Petre correlation bandwidths can be summed up for the summer data as: Usually the X band has a somewhat greater bandwidth than the C band. The percentile plots which are scheduled for the next report will present the more exact relationships, but for now it can be said that the correlation bandwidths are approximately equal a sufficient percentage of the time to assume that frequency diversity is essentially equally available at X band as it is at C band. One can conclude that the multipath spread is approximately the same for either frequency and hence the wider antenna beamwidth of C band does not result in additional scatter volume.

The most important implication of this finding is that frequency diversity at X band is equally available as it is at C band when using 10 foot antennas. In fact, the C-band 10 foot antennas have a beamwidth that evidently illuminates considerably more than the maximum effective scatter volume for these paths which are typical of the MALLARD troposcatter link. Another conclusion which is evident regarding C band is that the beamwidth can be reduced by increasing the antenna diameter without losing frequency diversity. Just how far we can go in this direction can be worked out from RAKE data, but for now we know that we could increase the C-band gain to at least the same as the present X-band gain.

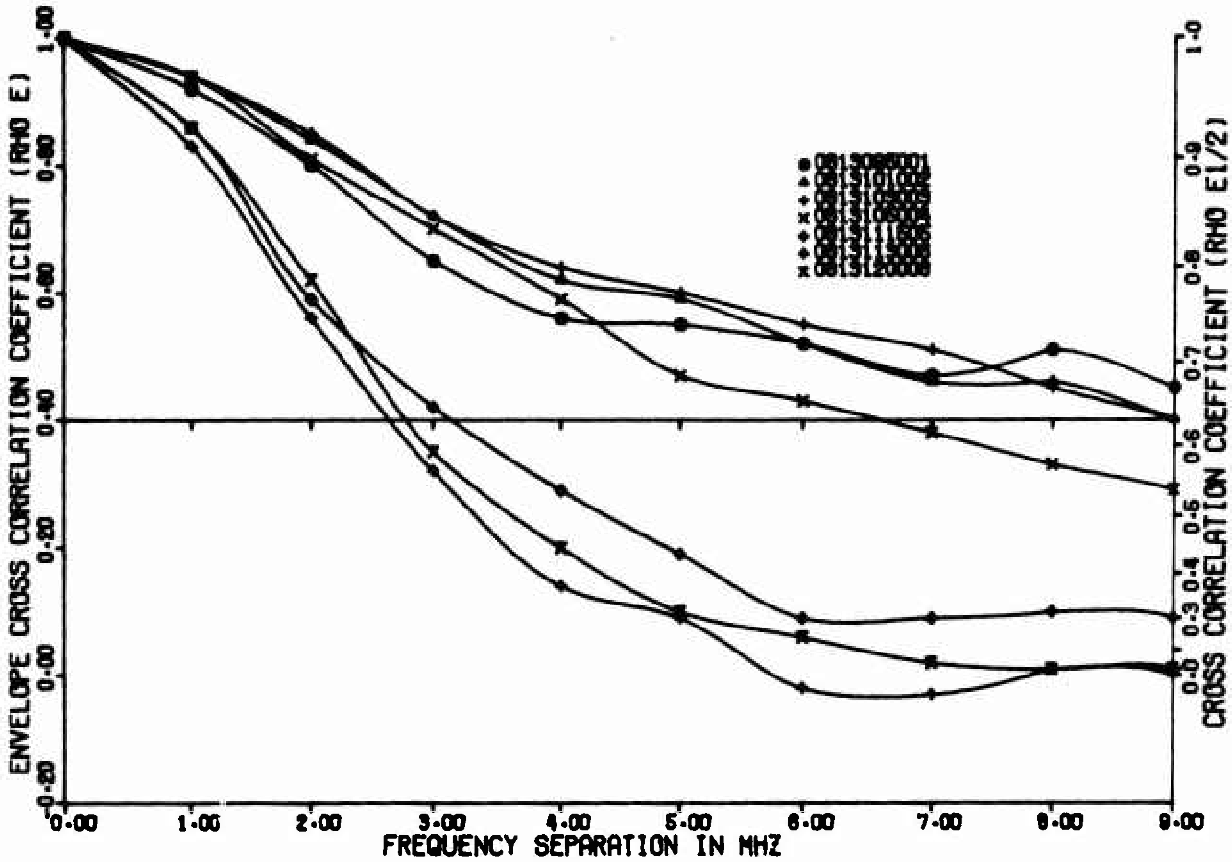


Figure 3. Envelope Cross Correlation Coefficients
Ontario Center, Summer, C-Band, Wide

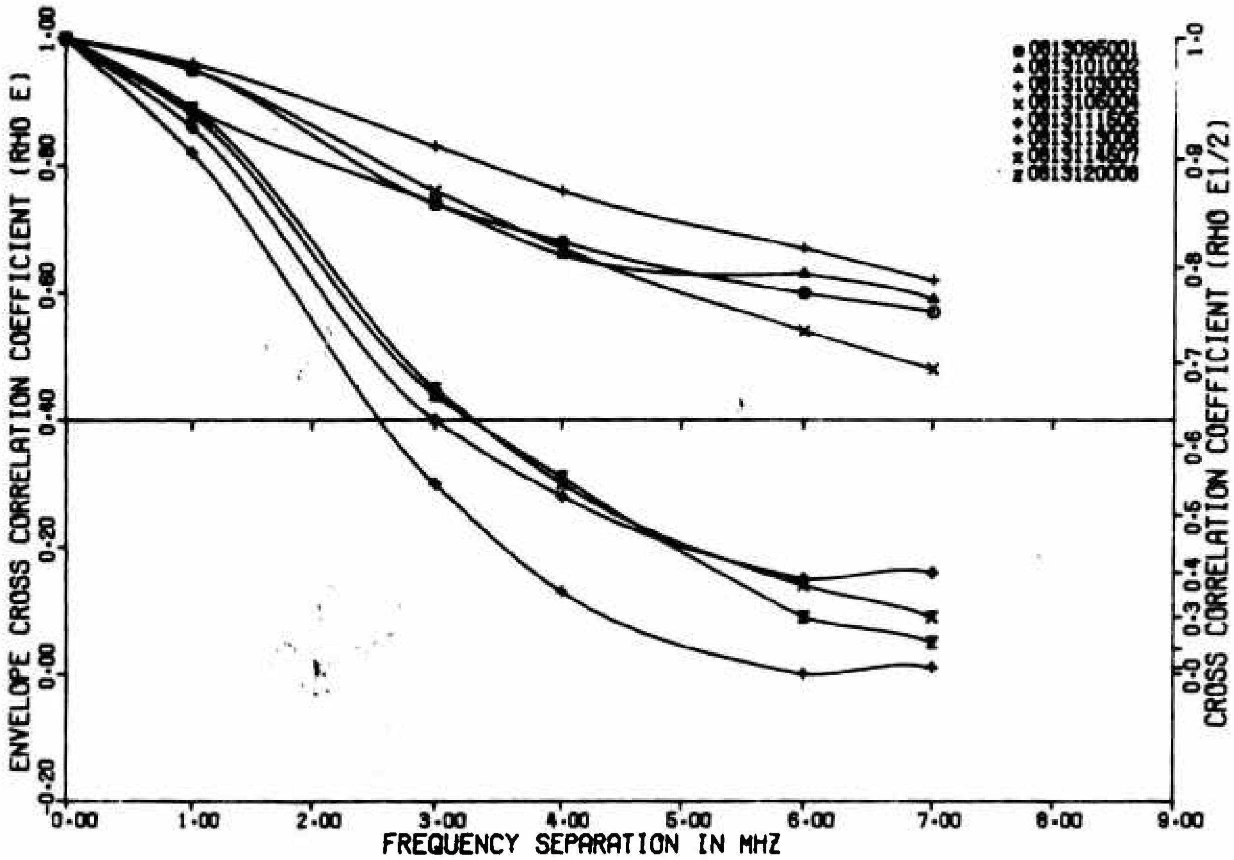


Figure 4. Envelope Cross Correlation Coefficients
Ontario Center, Summer, X-Band, Wide

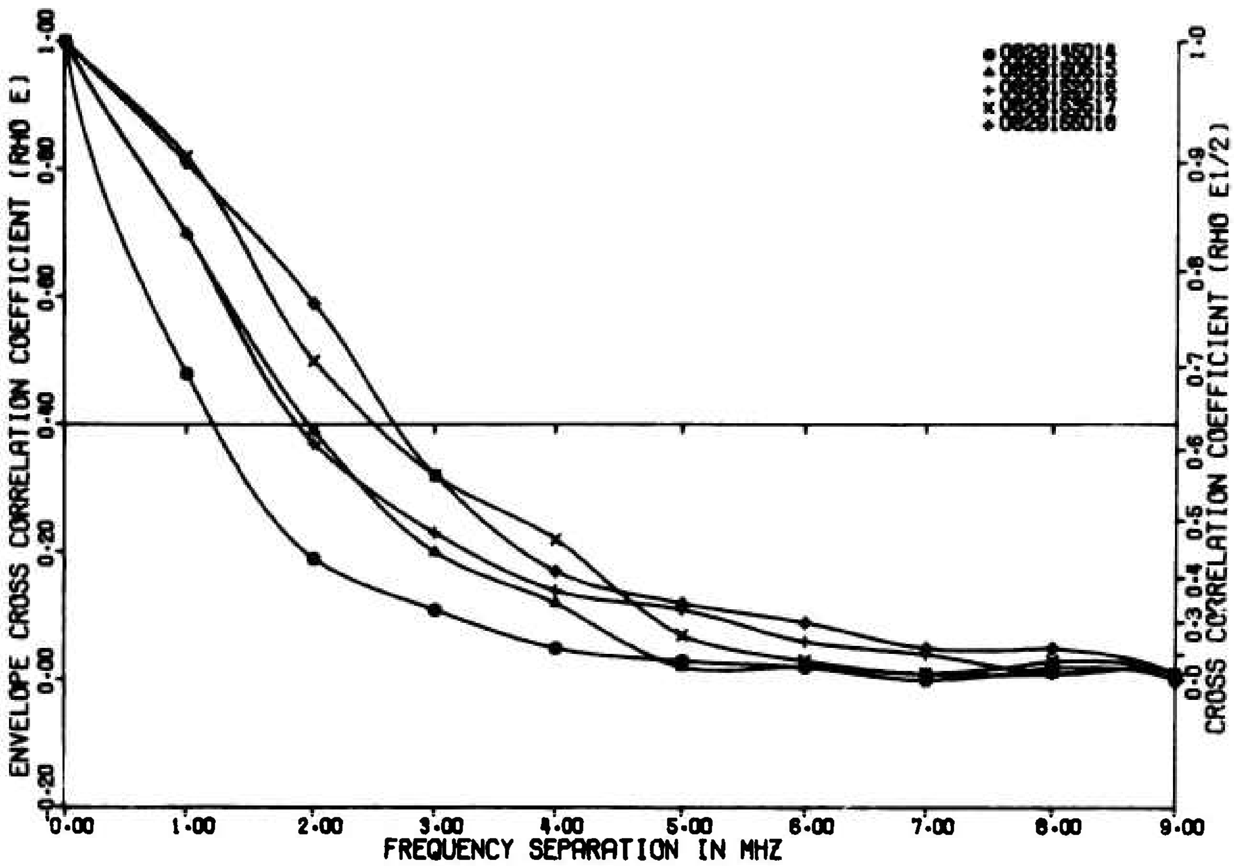


Figure 5. Envelope Cross Correlation Coefficients
Whitford Field, Summer; C-Band, Wide

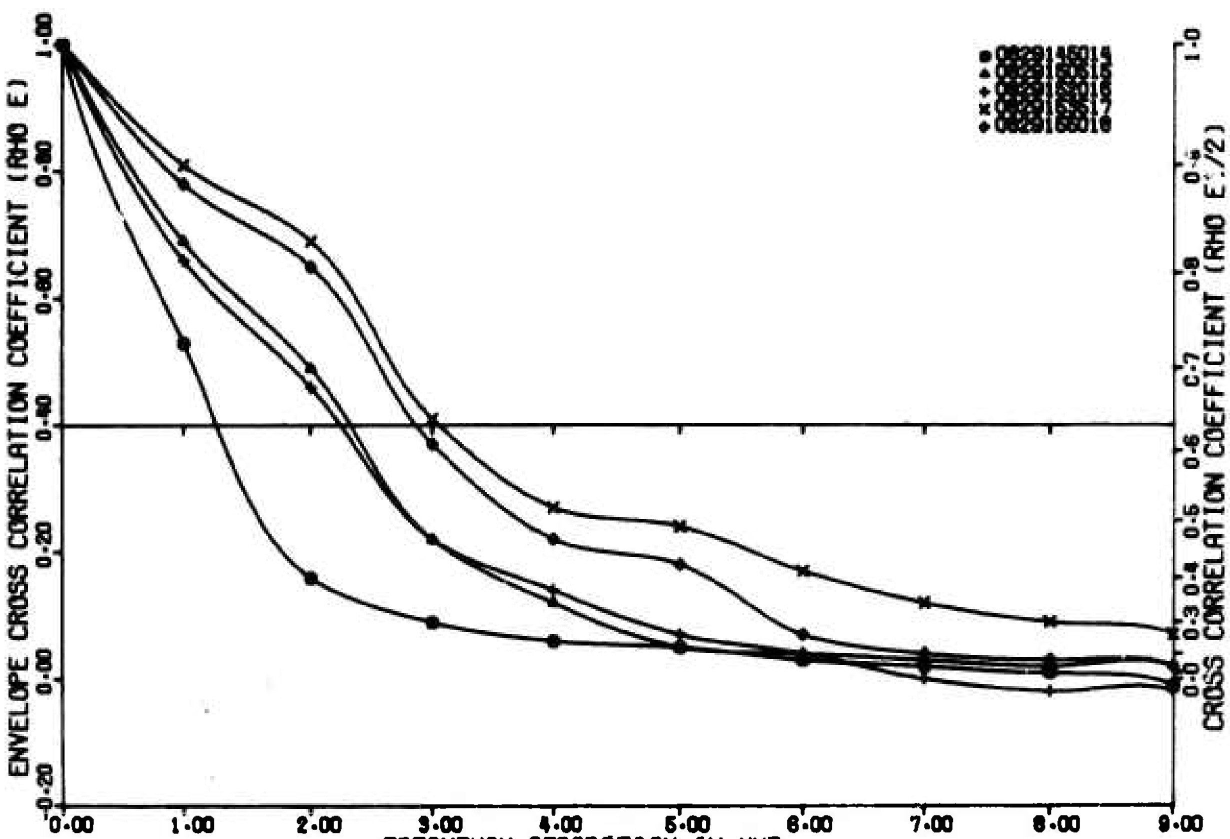


Figure 6. Envelope Cross Correlation Coefficients
Whitford Field, Summer; X-Band, Wide

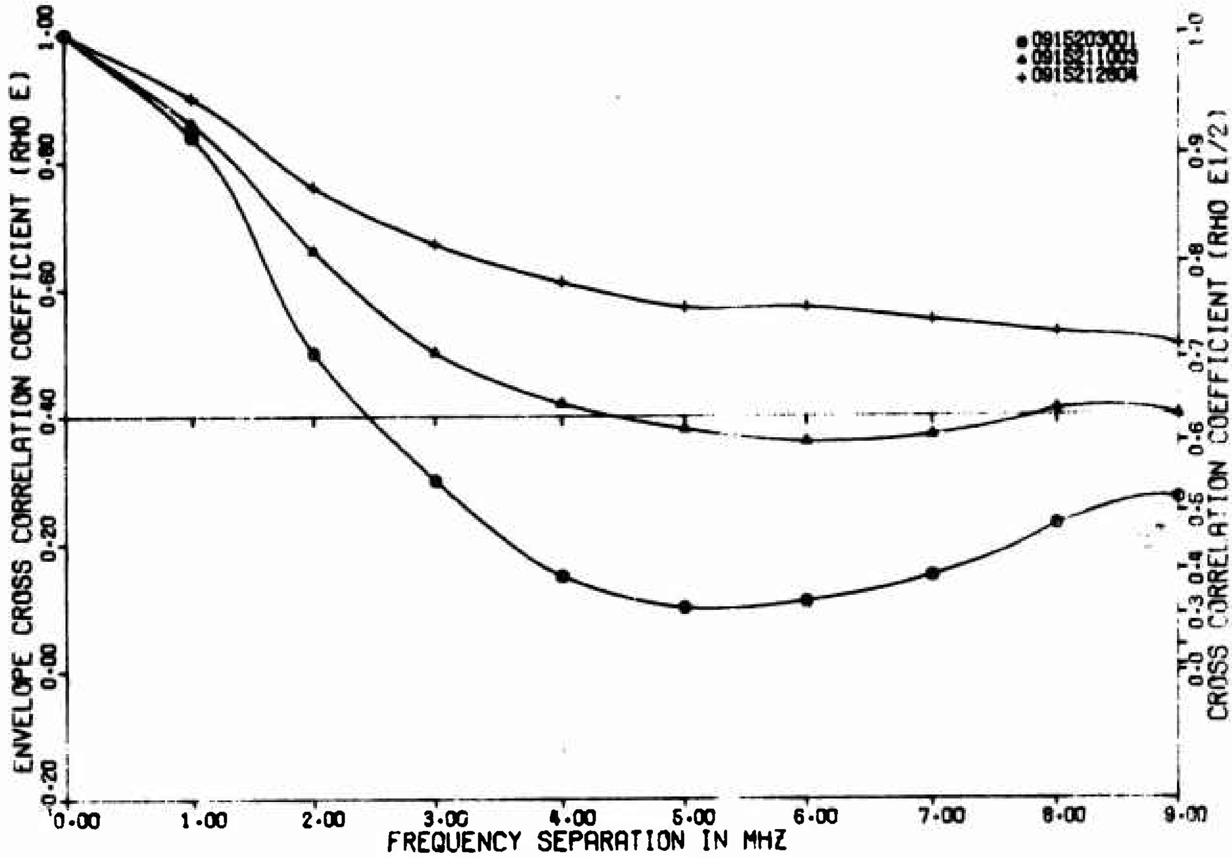


Figure 7. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Wide

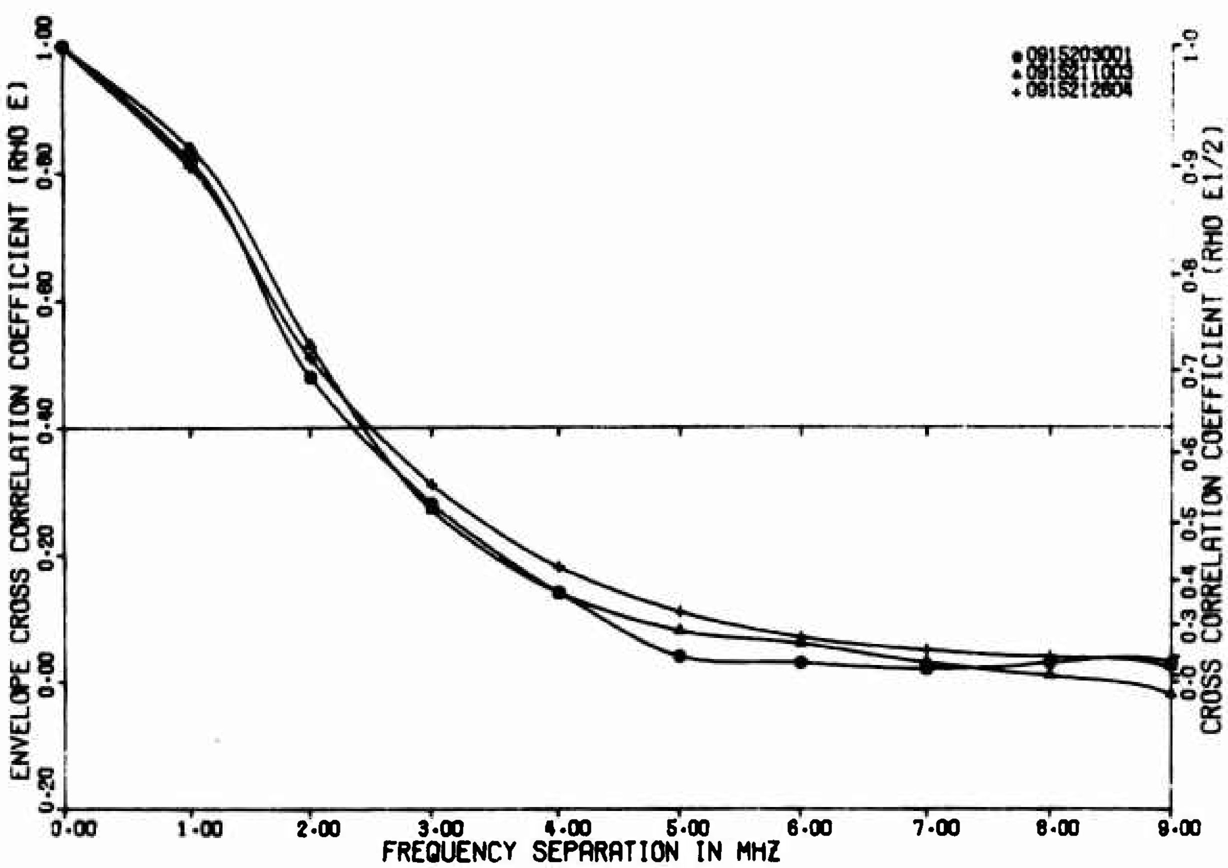


Figure 8. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Wide

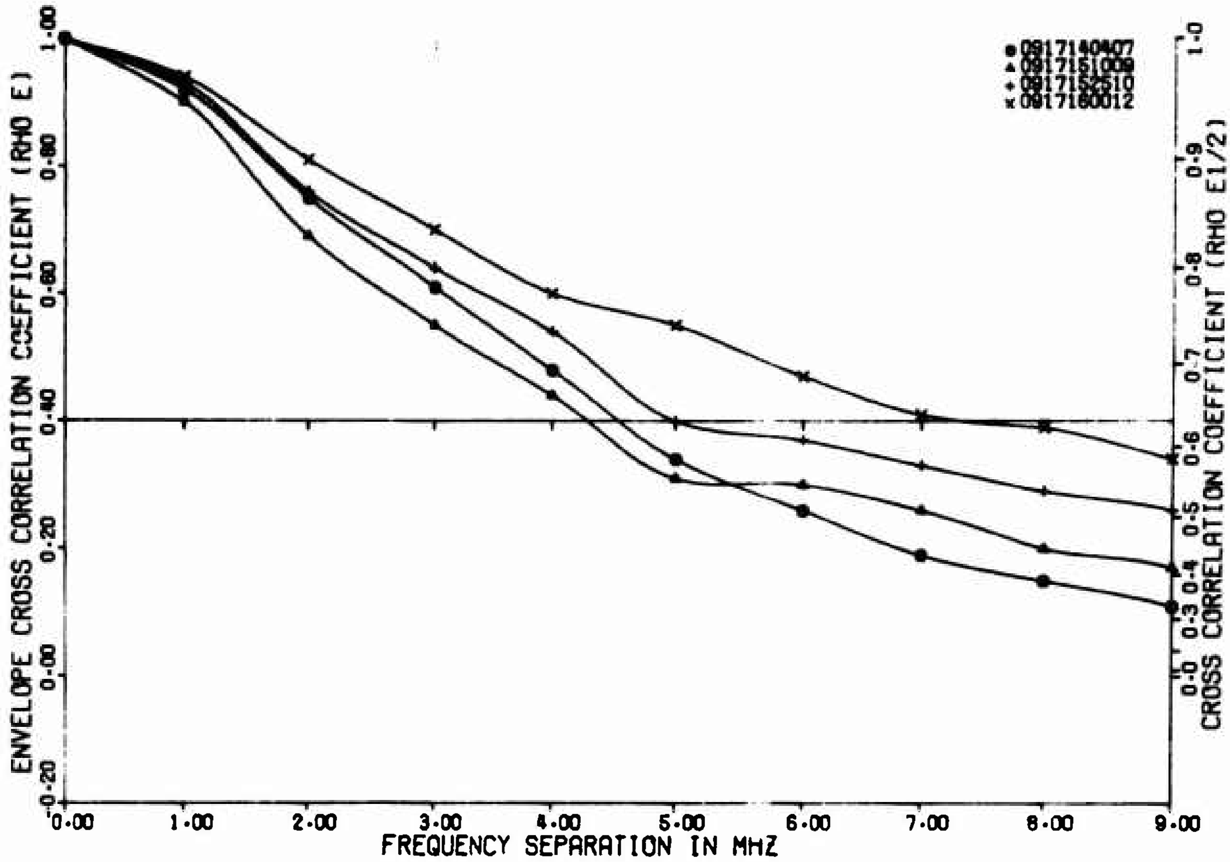


Figure 9. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Wide

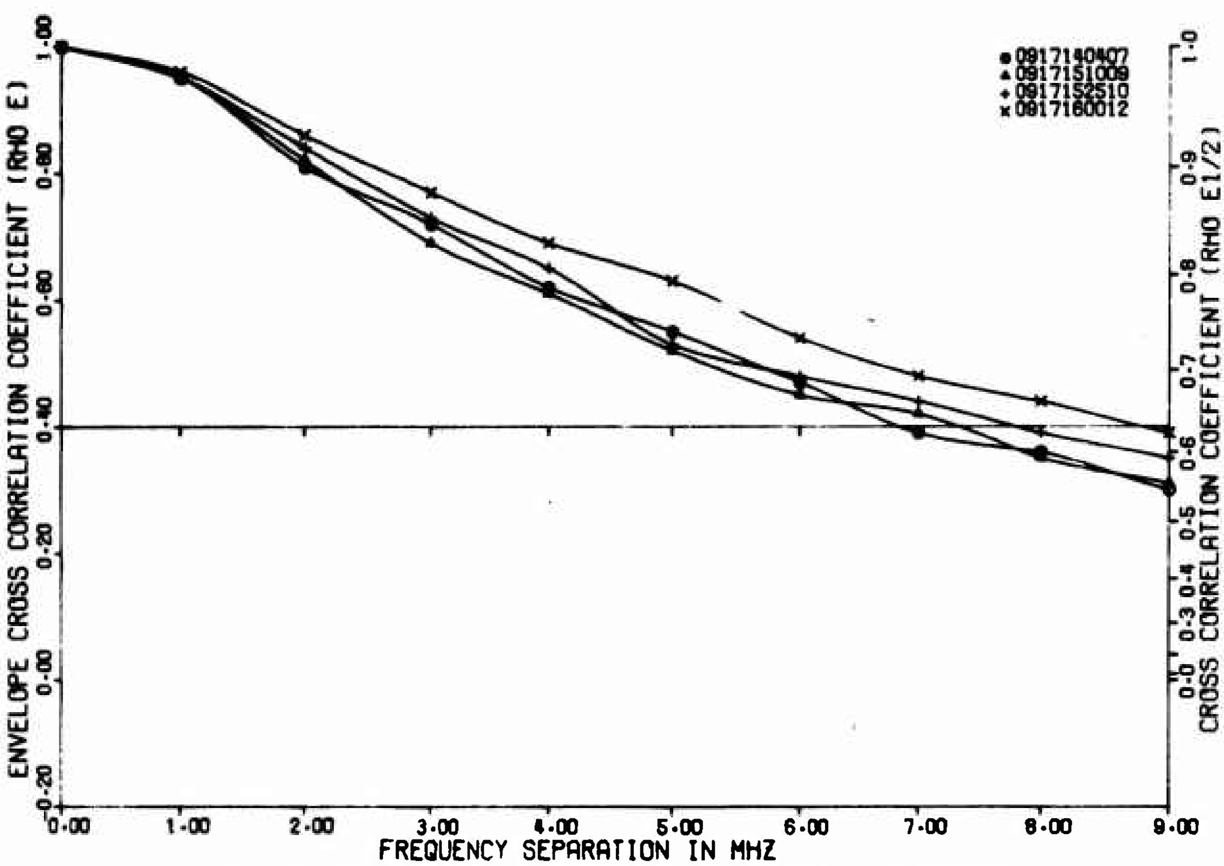


Figure 10. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Wide

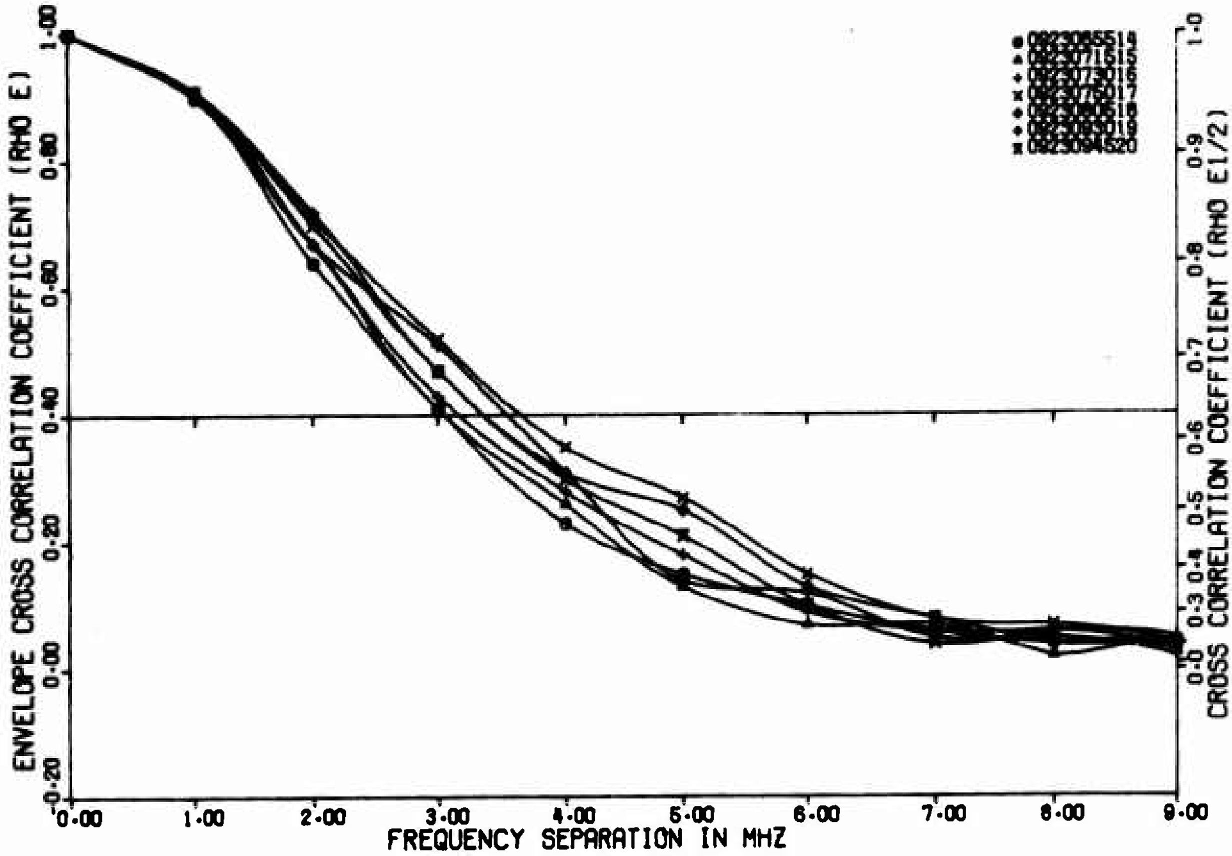


Figure 11. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Wide

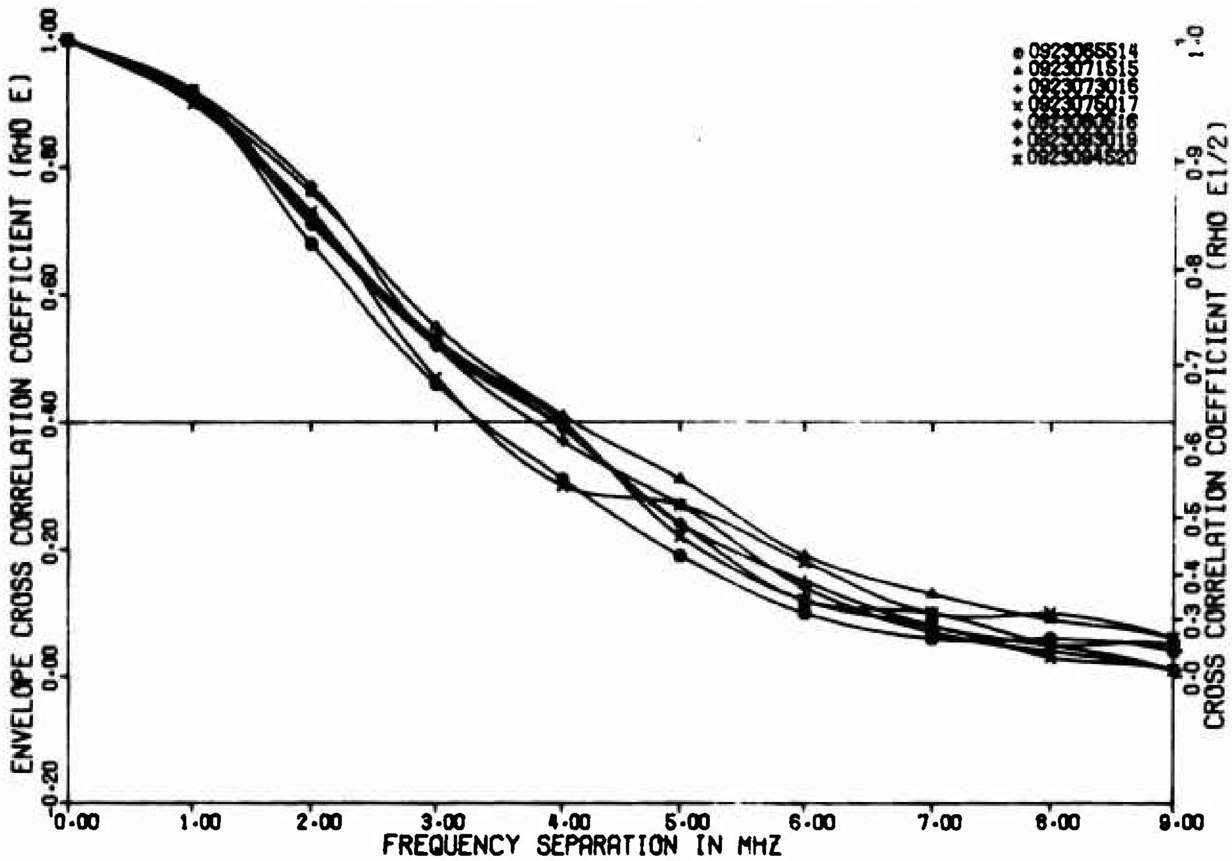


Figure 12. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Wide

B. DIURNAL EFFECTS ON CORRELATION BANDWIDTH

The diurnal effects shown in Figures 3 and 4 are of great interest because of the marked discontinuity between the fourth and fifth test on 13 August at Ontario Center. The same discontinuity is observed for both C- and X-band testing. Examination of the Rochester, N. Y. weather records for that day do not indicate any marked change in the weather observed on the ground, but quite evidently significant changes had taken place in the common volume.

A study of the fade rate distributions will show that the fade rates were in general dropping throughout the day (Figures 13 and 14), except during the discontinuity in correlation bandwidth at which time the fade rates increased. This suggests that two competing processes were in effect at the time of the discontinuity. Similarly, the distribution of fade durations (Figures 15 through 18) of the first four wideband tests show no particular variation between the first four tests which resulted in the wide correlation bandwidth and the remaining tests which resulted in the narrower bandwidth group.

While one cannot be conclusive about the weather aloft, one can hypothesize that the scattering mechanism changed from a stable phenomenon such as layers to a more turbulent phenomenon in which the atmosphere is unstable. A model for predicting this unstable behavior is currently under study and is scheduled for inclusion in the next interim report.

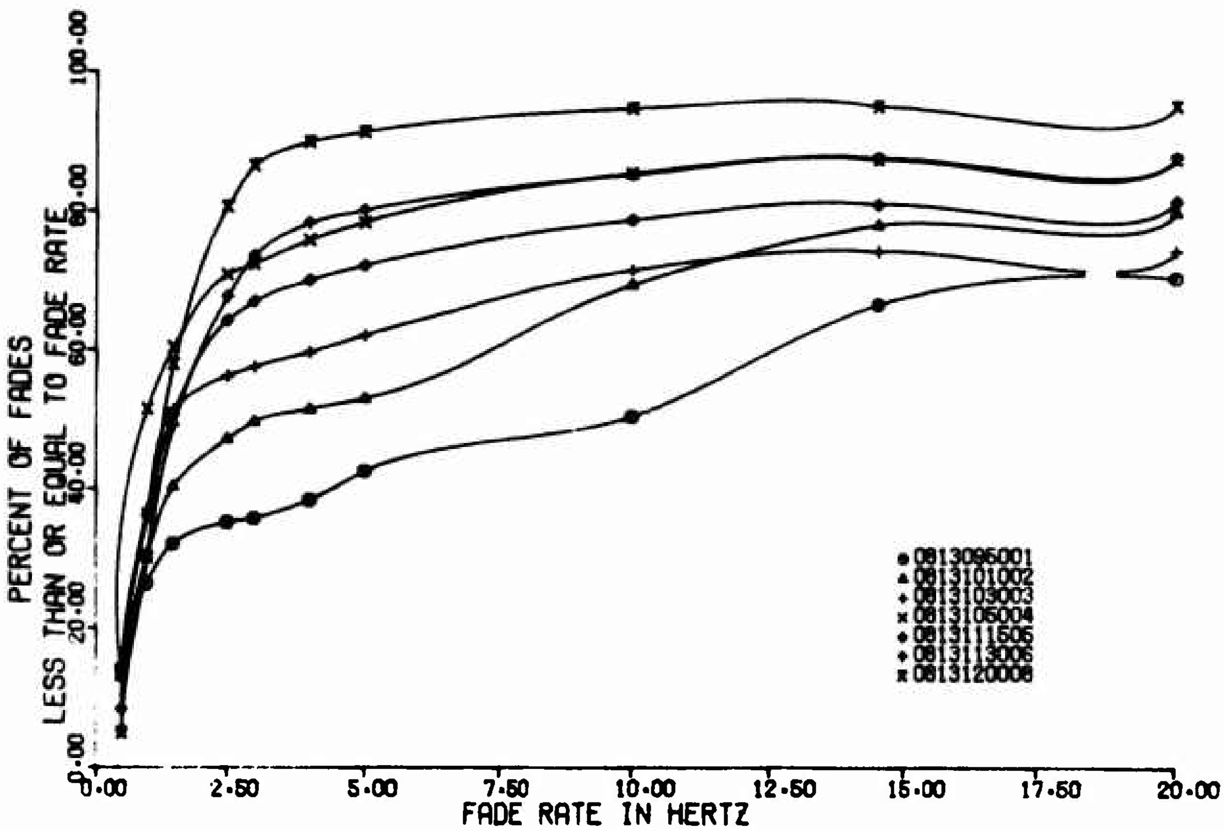


Figure 13. Fade Rate Distribution; Ontario Center, Summer; C-Band

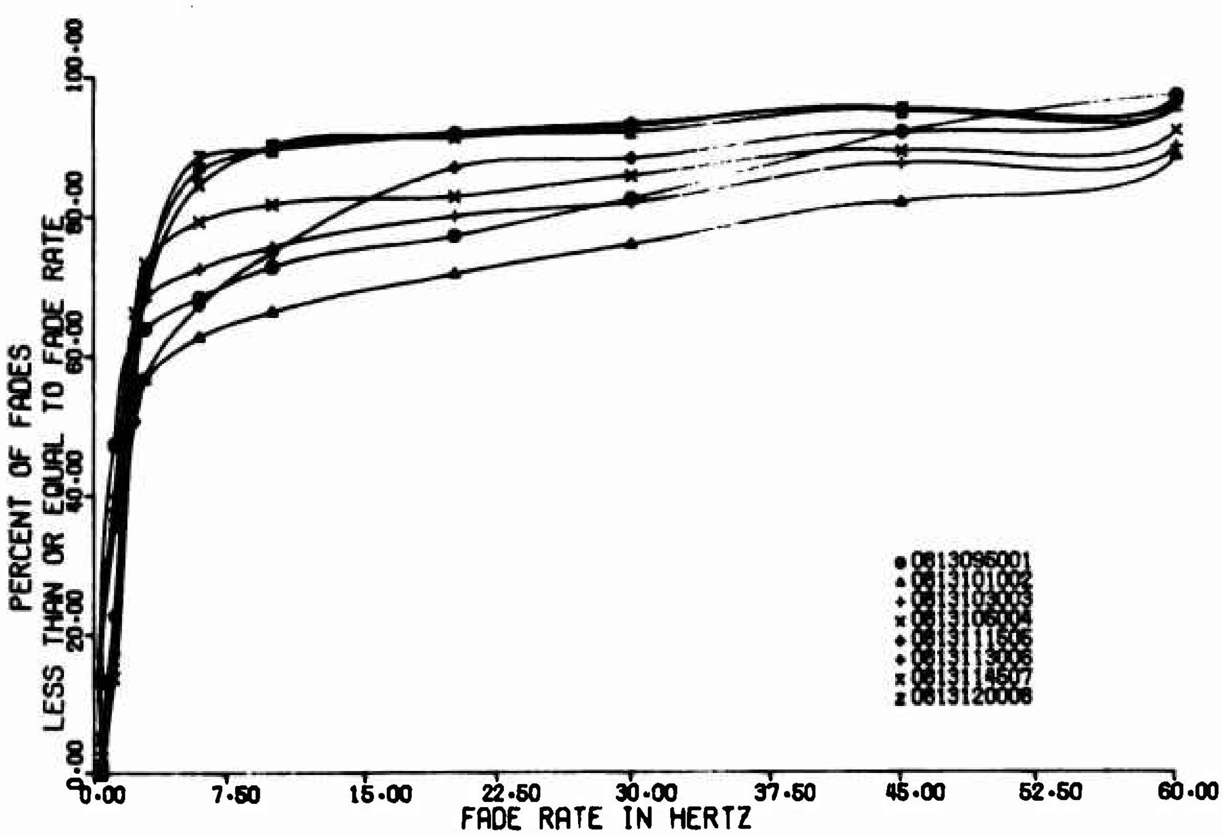


Figure 14. Fade Rate Distribution; Ontario Center, Summer; X-Band

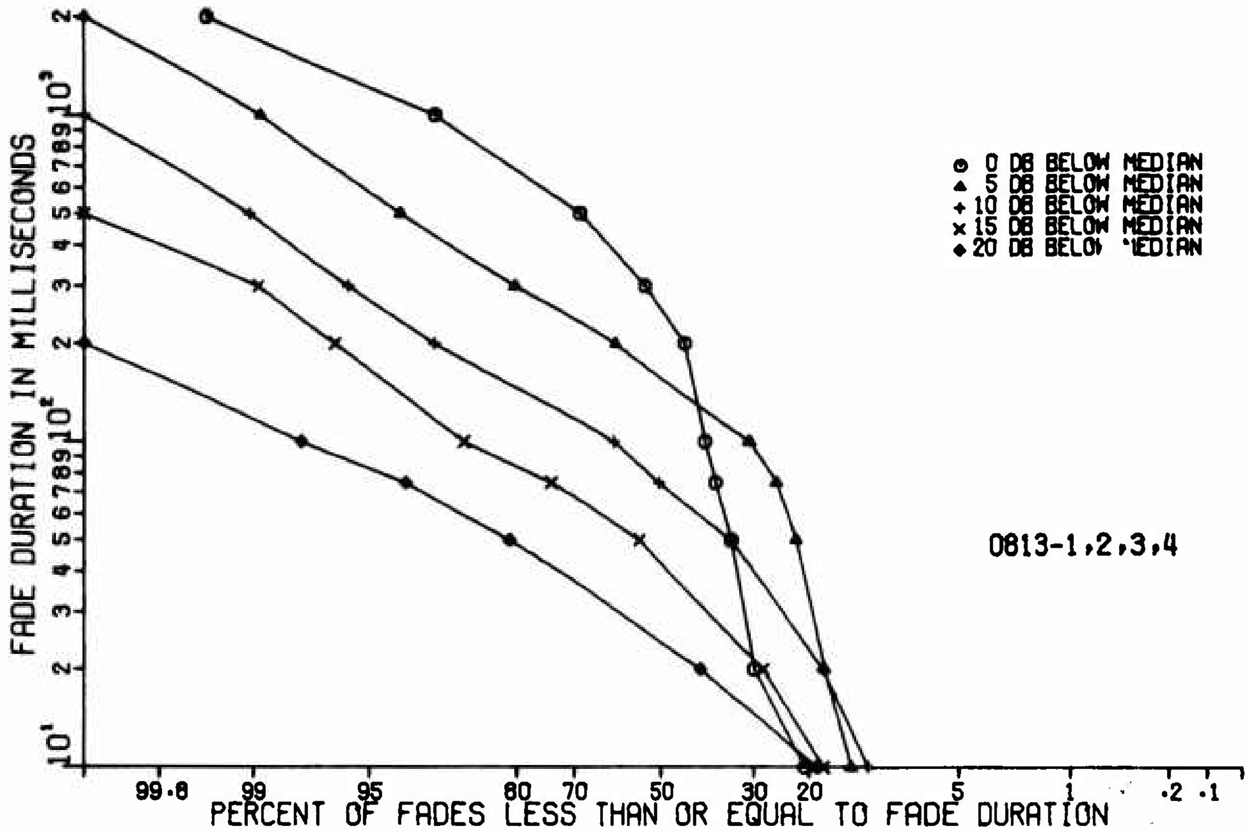


Figure 15. Distribution of Fade Duration; Ontario Center, Summer; C-Band

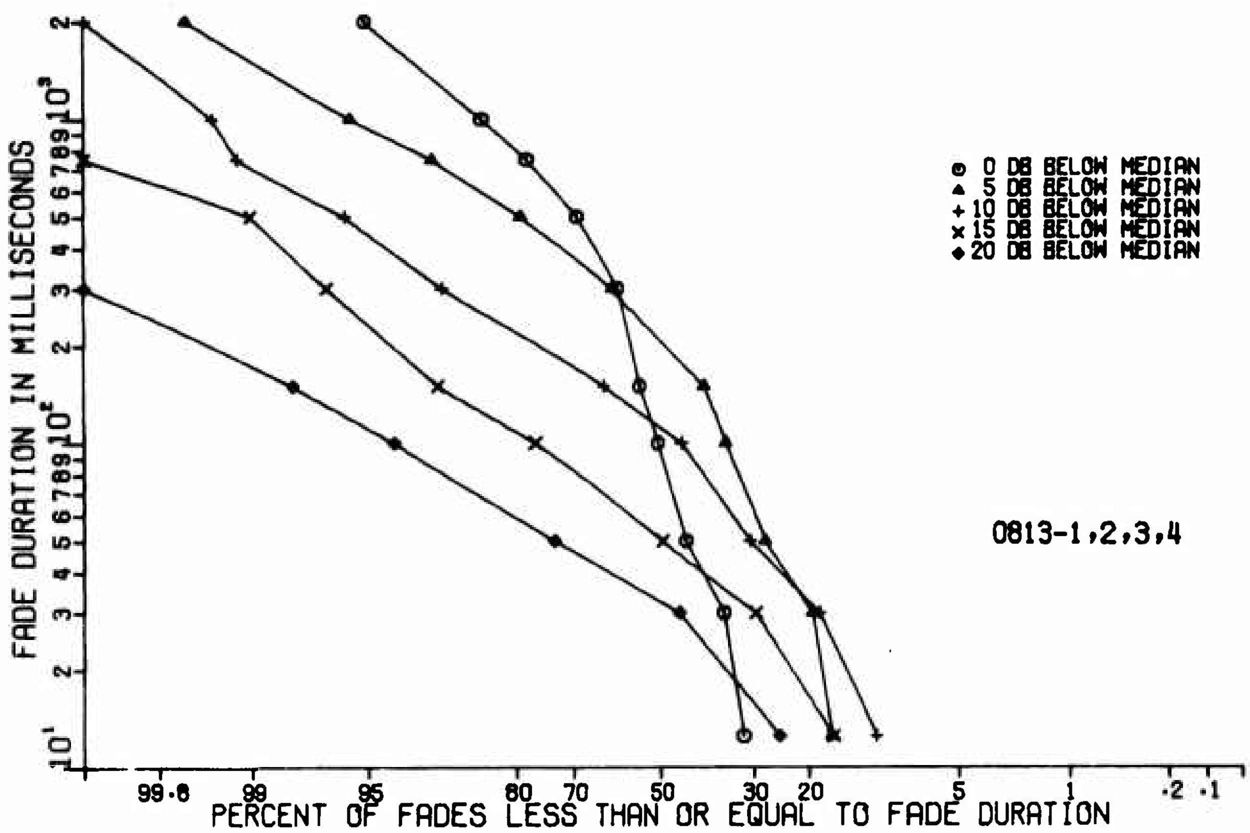


Figure 16. Distribution of Fade Duration; Ontario Center, Summer; X-Band

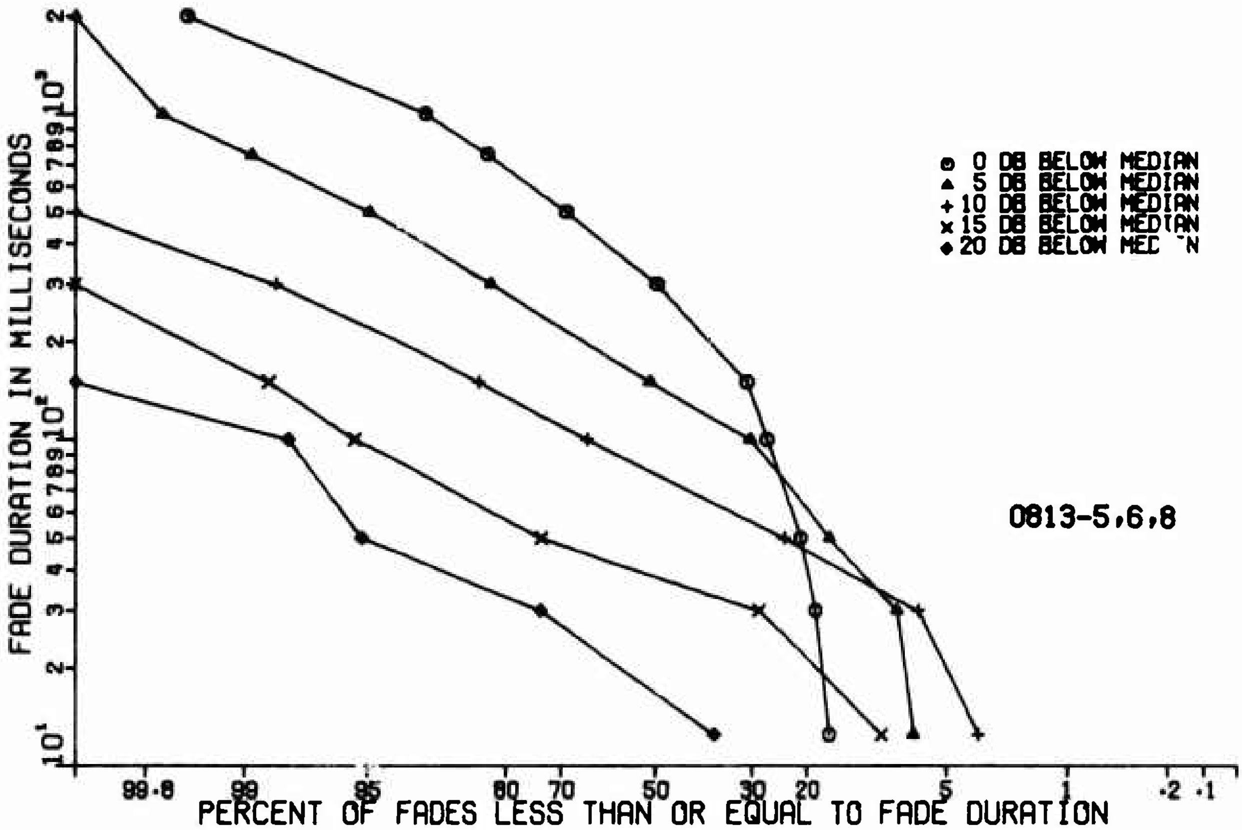


Figure 17. Distribution of Fade Duration
Ontario Center, Summer; C-Band

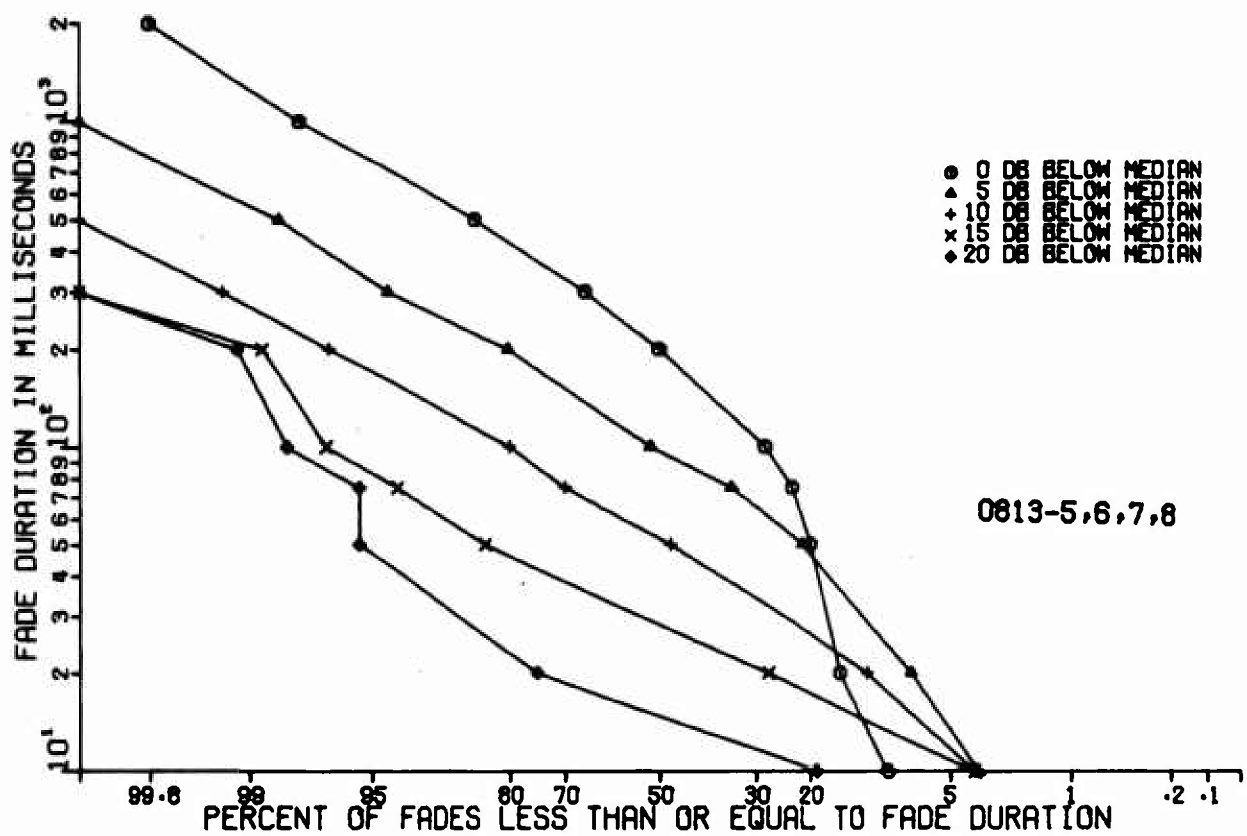


Figure 18. Distribution of Fade Duration
Ontario Center, Summer; X-Band

C. NARROW SPACING CORRELATION COEFFICIENT MEASUREMENTS

The narrow spacing tests indicate that the derivative of the cross correlation coefficient with respect to frequency at the origin is small and likely to be zero for both C and X band. This conclusion is supported by the plots for Ontario Center, Whitford and Point Petre (Figures 19 through 23). The data do not show conclusively that it is zero, however.

This derivative has importance in the prediction of nonreducible error rates for certain digital modems that use frequency-time matrices in their coding structure. A simple exponential function for correlation predicts a nonreducible error rate of about 10^{-7} BER while a gaussian function whose derivative is zero at the origin predicts a nonreducible BER of 10^{-11} (see Reference 2).

In the next period some narrow band tests will be considered using a spacing of 50 kHz to make a final test of the derivative of the cross correlation coefficient at the origin. The test should be run to study the function closer to the origin, for the curves presented to be capable of being fitted to a simple exponential. The present instrumentation cannot operate much closer than this spacing due to frequency instabilities and the required bandwidth of each channel in the receiving system. The results will be presented in the next interim report.

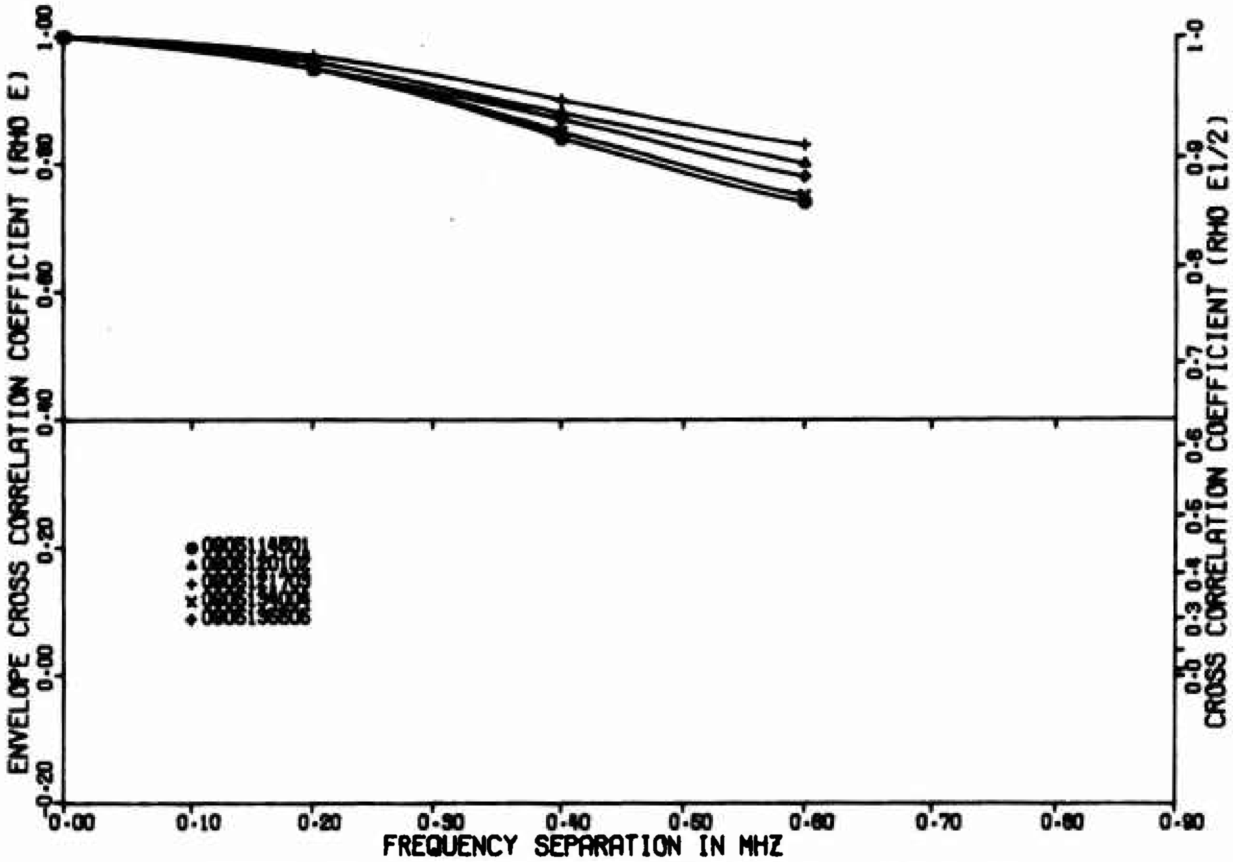


Figure 19. Envelope Cross Correlation Coefficients
Whitford Field, Summer; X-Band, Narrow

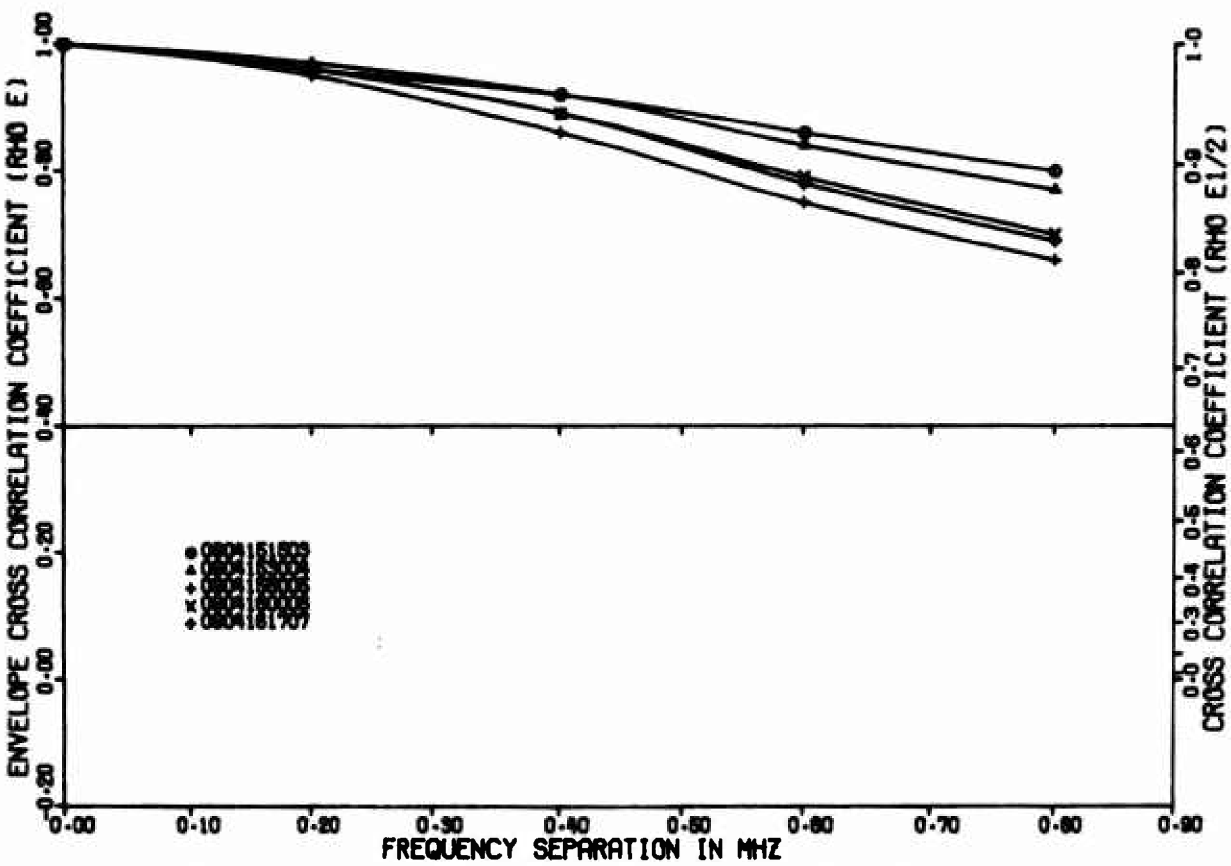


Figure 20. Envelope Cross Correlation Coefficients
Whitford Field, Summer; C-Band, Narrow

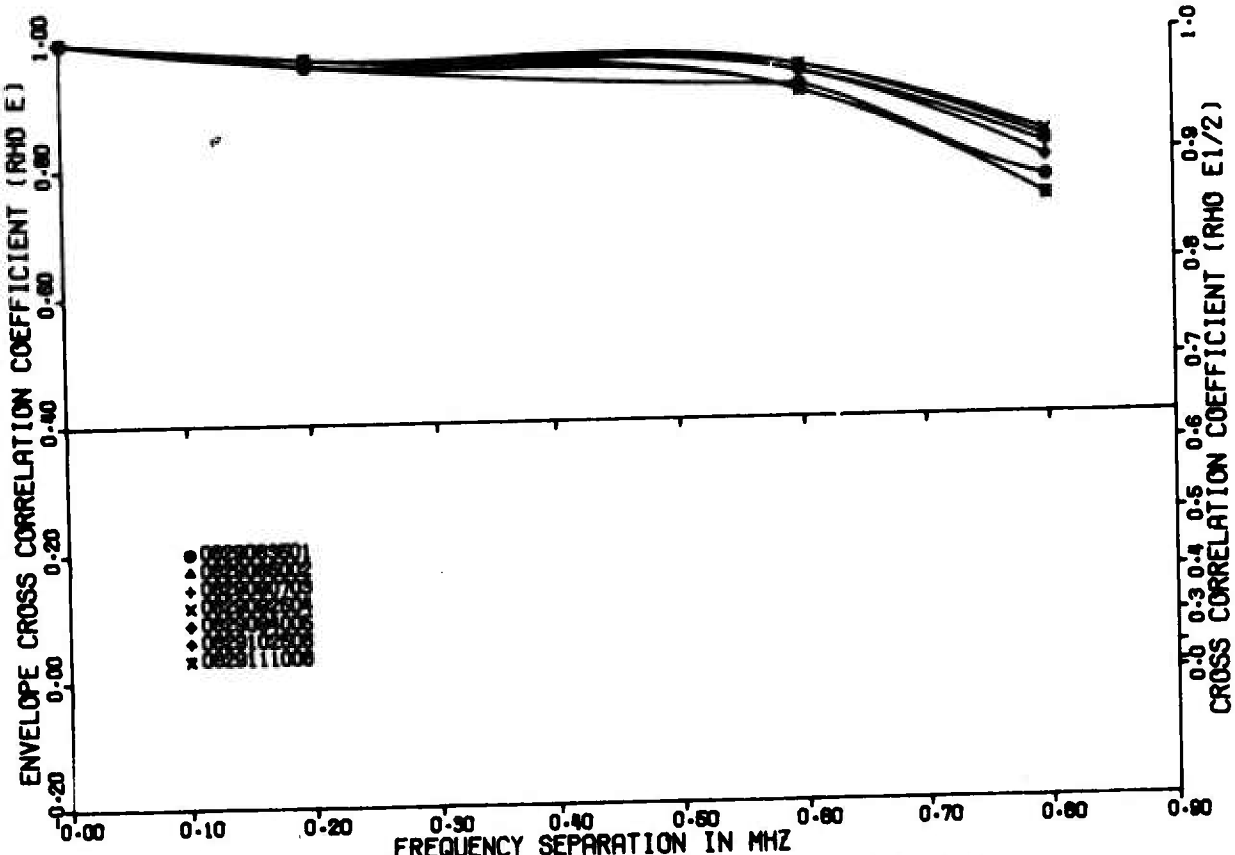


Figure 21. Envelope Cross Correlation Coefficients
Whitford Field, Summer; X-Band, Narrow

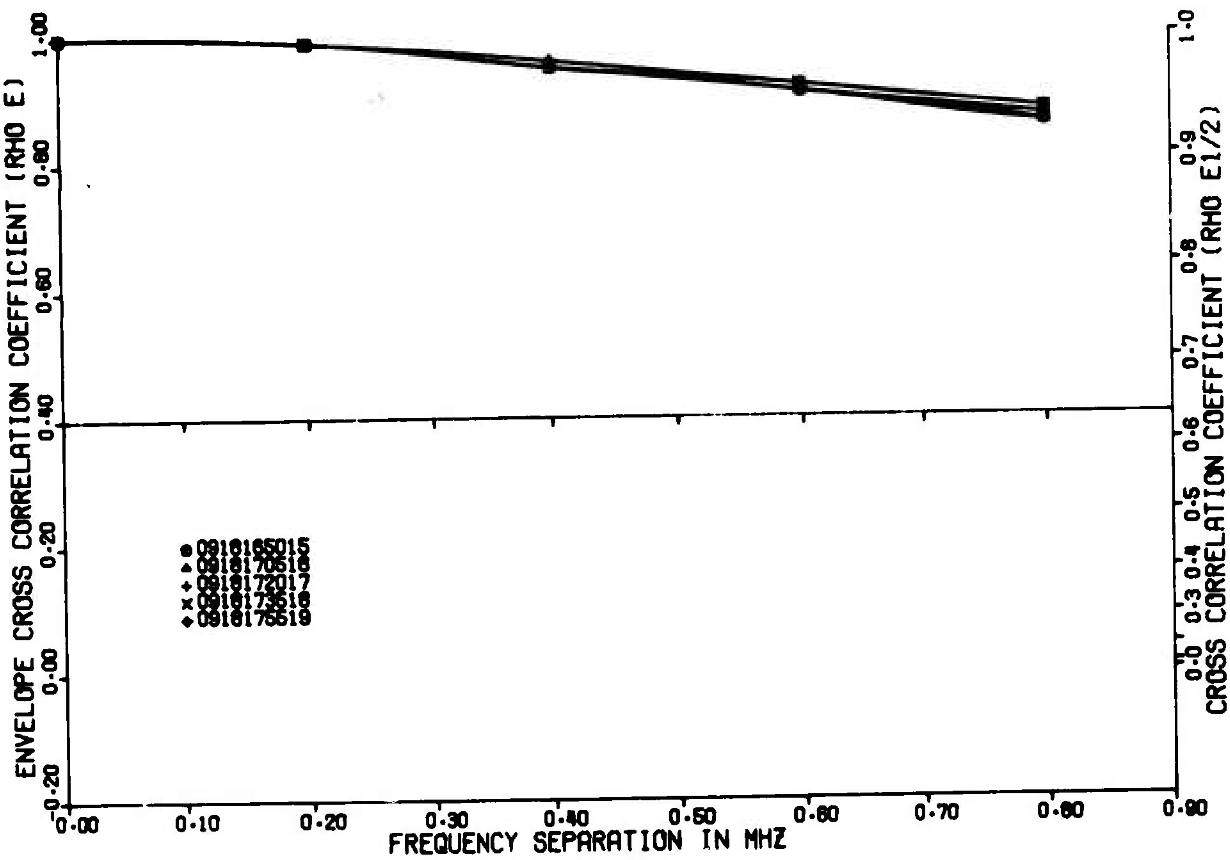


Figure 22. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Narrow

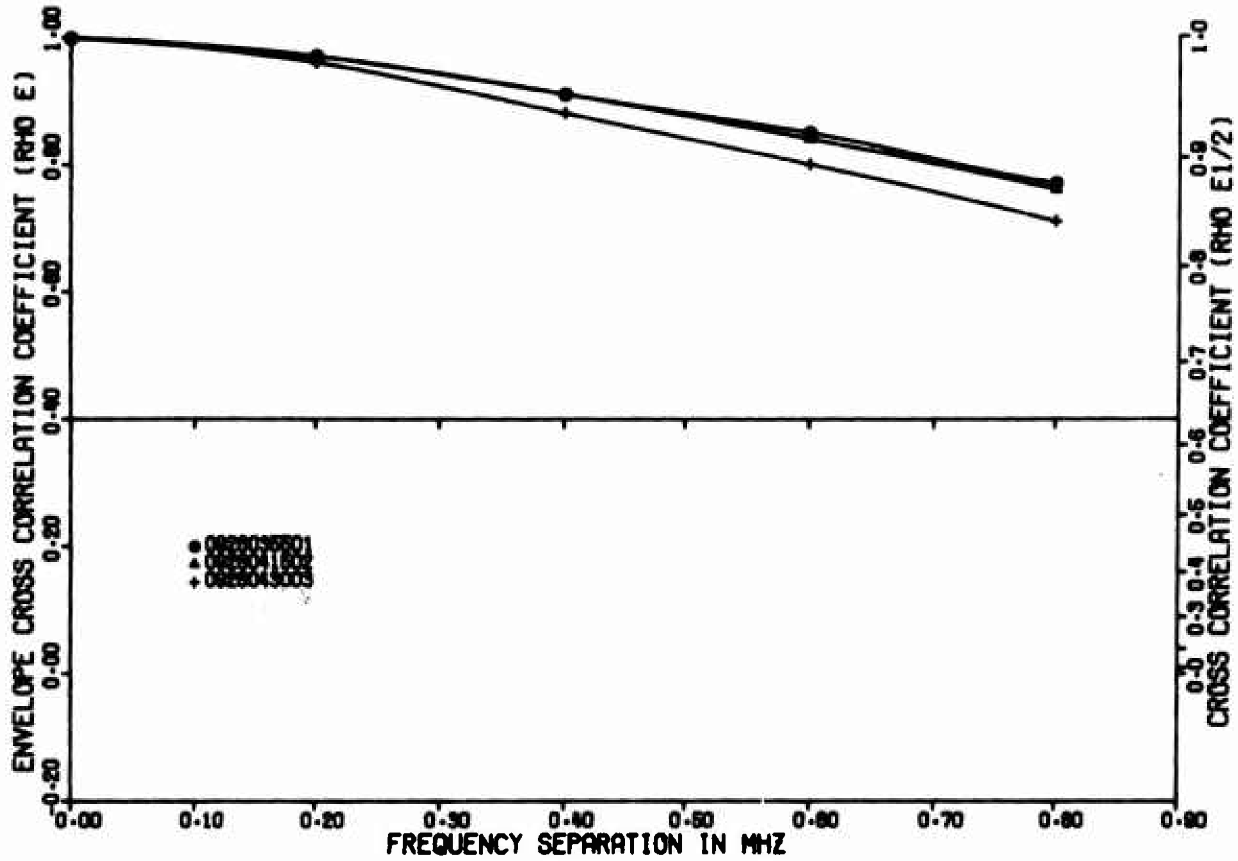


Figure 23. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Narrow

D. TYPICAL EXAMPLES OF PROPAGATION DATA

The following are representative sets of correlation bandwidth and fade statistics for the three paths during the summer of 1969. Plots of correlation bandwidth, fade rates, fade durations, signal amplitude distributions, and depth of fade distributions are presented in sets of X and C band over the same test numbers where available. In some cases the fade margins during the tests were not sufficient to plot more than correlation bandwidths and fade rates. This was especially true of the data taken at the Whitford field site due to low median signal strengths.

The curves are presented on a test by test basis to show the rapidly changing situation that exists in the troposphere that affects propagation of troposcatter signals. These changes occur over periods of a few seconds to a few hours, but rarely are they constant for an interval longer than a fraction of an hour. The next interim report will consider the upper and lower deciles of the measured variables to enable designers to establish criteria for the design of digital modems for use on the MALLARD troposcatter links.

1. Ontario Center

The Ontario Center RADC test site is the shortest range troposcatter terminal in this series. It is 140 km from the transmitter at the RADC test site in Model City, N. Y. This short range would naturally predict the widest correlation bandwidth according to the curve used in the first interim report. The set of curves in Figures 24 through 28 represent the widest X-band cross correlation coefficients obtained during the summer testing period. There are no C-band data available to compare with this set of data since the C-band transmitter was inoperative at the time. Figures 29 through 33 are typical of the C-band data and show the typical extremes through which the correlation bandwidths vary during the day. Note that there is an almost one for one correspondence of the companion X-band data (Figures 34 through 38). Figures 39 through 43 show typical data obtained during the summer for C band. The data of 19 August 1969 for C band are typical of the narrowest bandwidths obtained on this path. Figures 44 through 48 and 49 through 53 are simultaneous pairs of C- and X-band tests with the exception of two tests. Here a tendency for the fade rates to run unpredictably high is very noticeable. The high fade rates caused the cumulative distributions of fade durations to appear erratic in both the X- and C-band cases. These high fade rates occur often enough to be viewed with concern because adaptive frequency modems must have time to communicate the best operating frequency across the link. These fade rates are in excess of 60 Hz and put the best frequency commands in a dangerous time shortage.

One can conclude that the correlation bandwidths on the short path are probably the widest to be expected on MALLARD troposcatter links. While this might cause some slight loss in frequency diversity, it should be noted that this disadvantage is overcome by the abundance of fade margin which was always available over this short path (see Appendix B for signal strengths). Of course, the previous conclusion that the correlation bandwidths are about the same for C or X band are noticeable in these data as well as the data presented in section III.

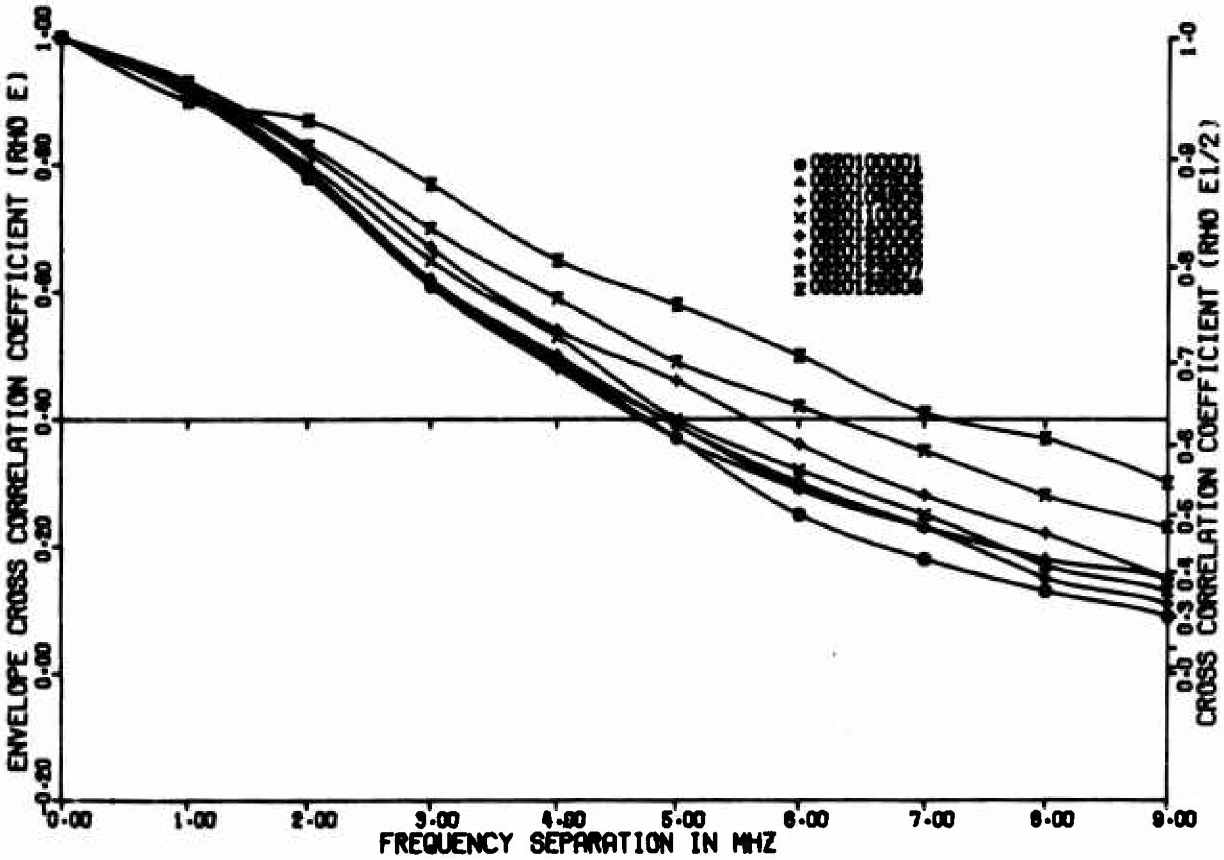


Figure 24. Envelope Cross Correlation Coefficients
Ontario Center, Summer; X-Band, Wide

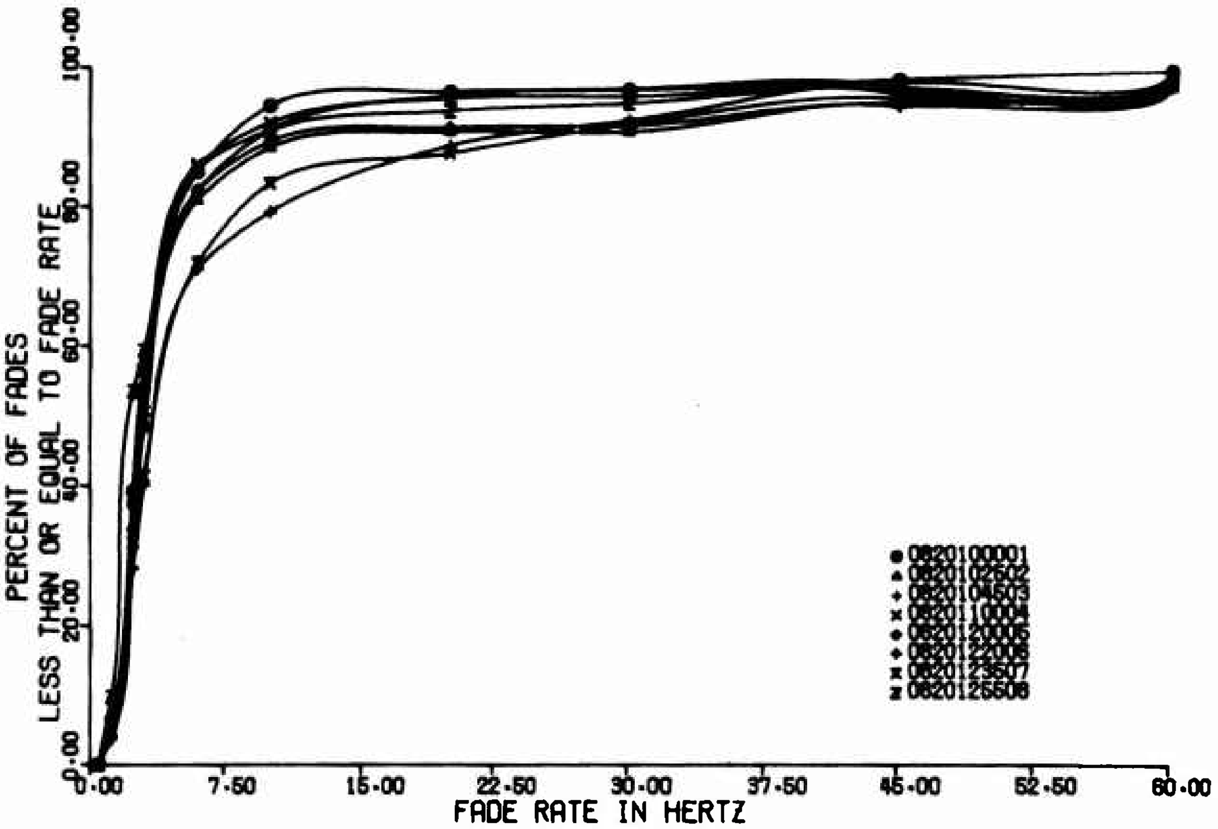


Figure 25. Fade Rate Distribution
Ontario Center, Summer; X-Band

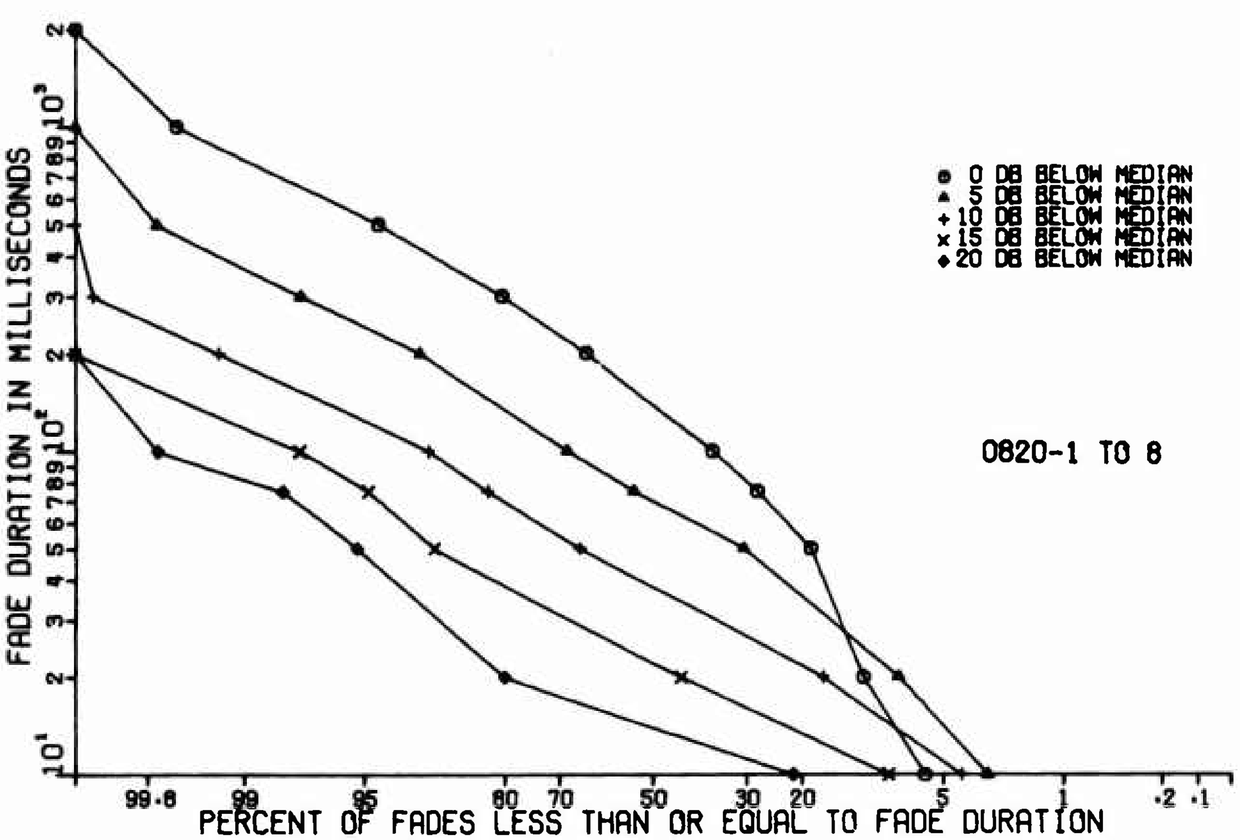


Figure 26. Distribution of Fade Duration
Ontario Center, Summer; X-Band

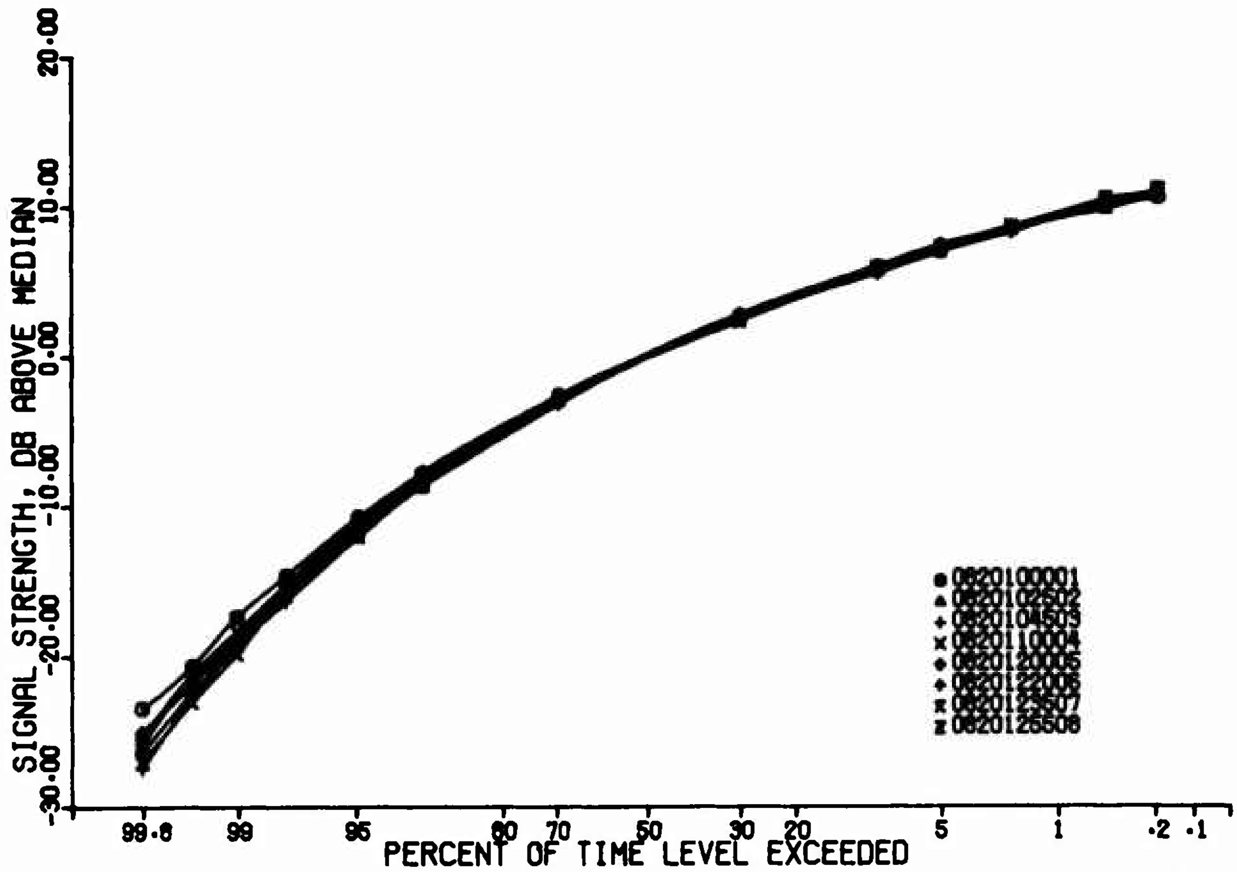


Figure 27. Signal Amplitude Level
Ontario Center, Summer; X-Band

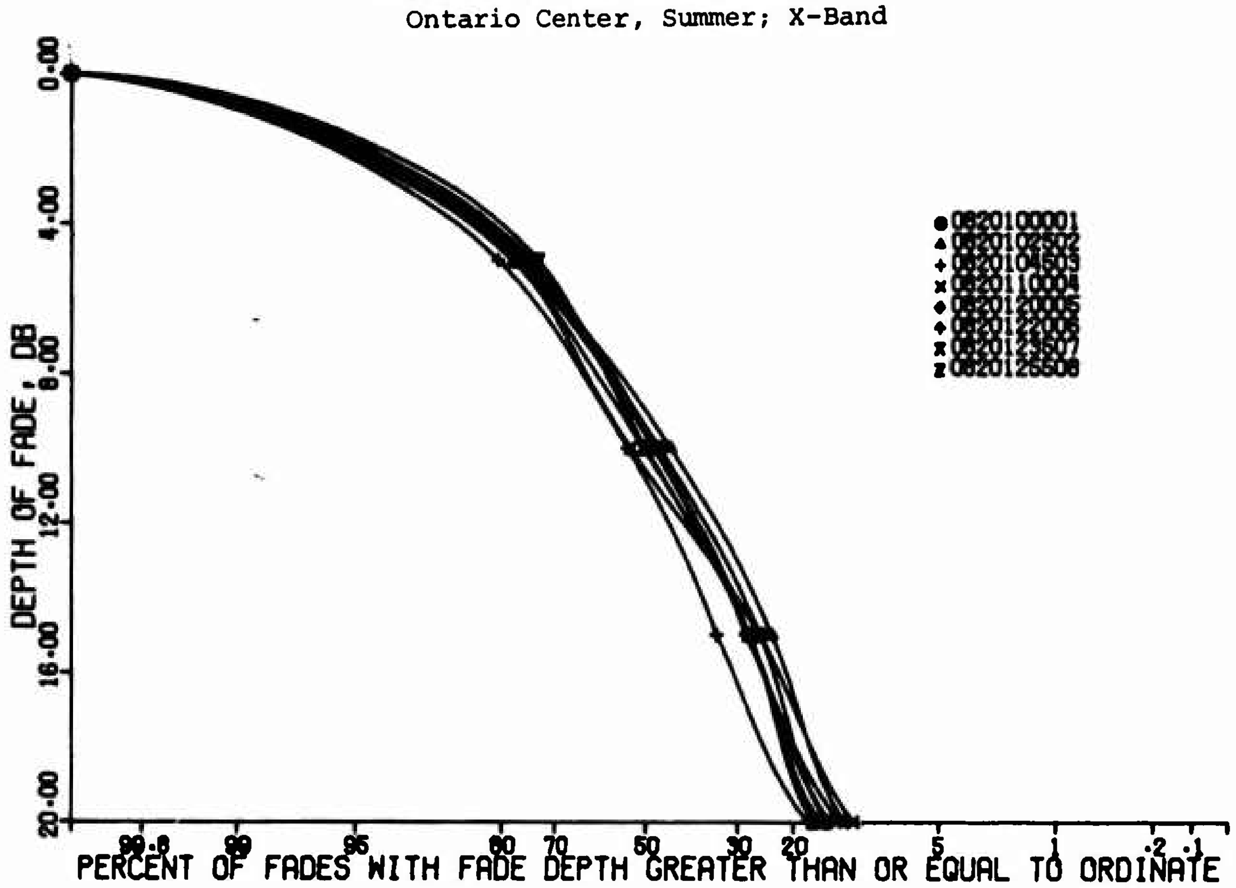


Figure 28. Distribution of Depth of Fades
Ontario Center, Summer; C-Band

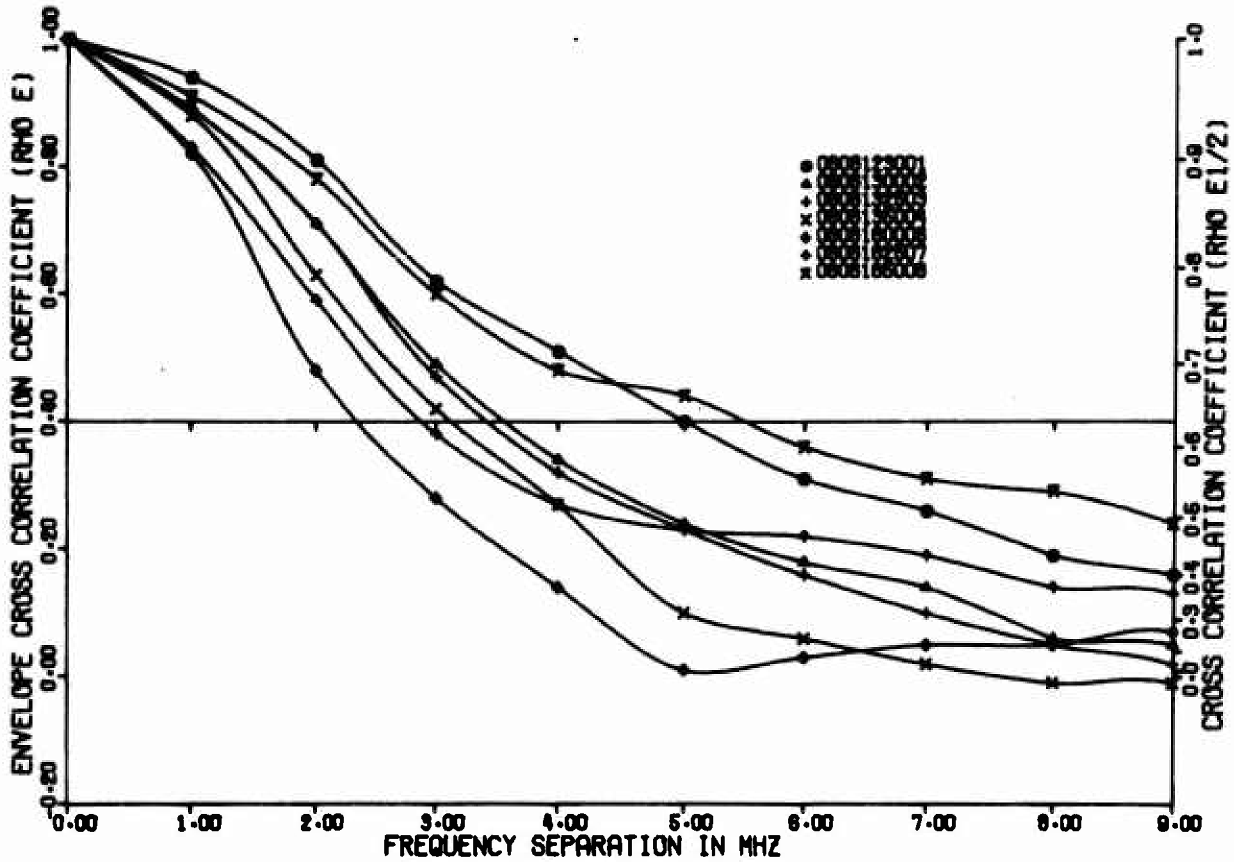


Figure 29. Envelope Cross Correlation Coefficients
Ontario Center, Summer; C-Band, Wide

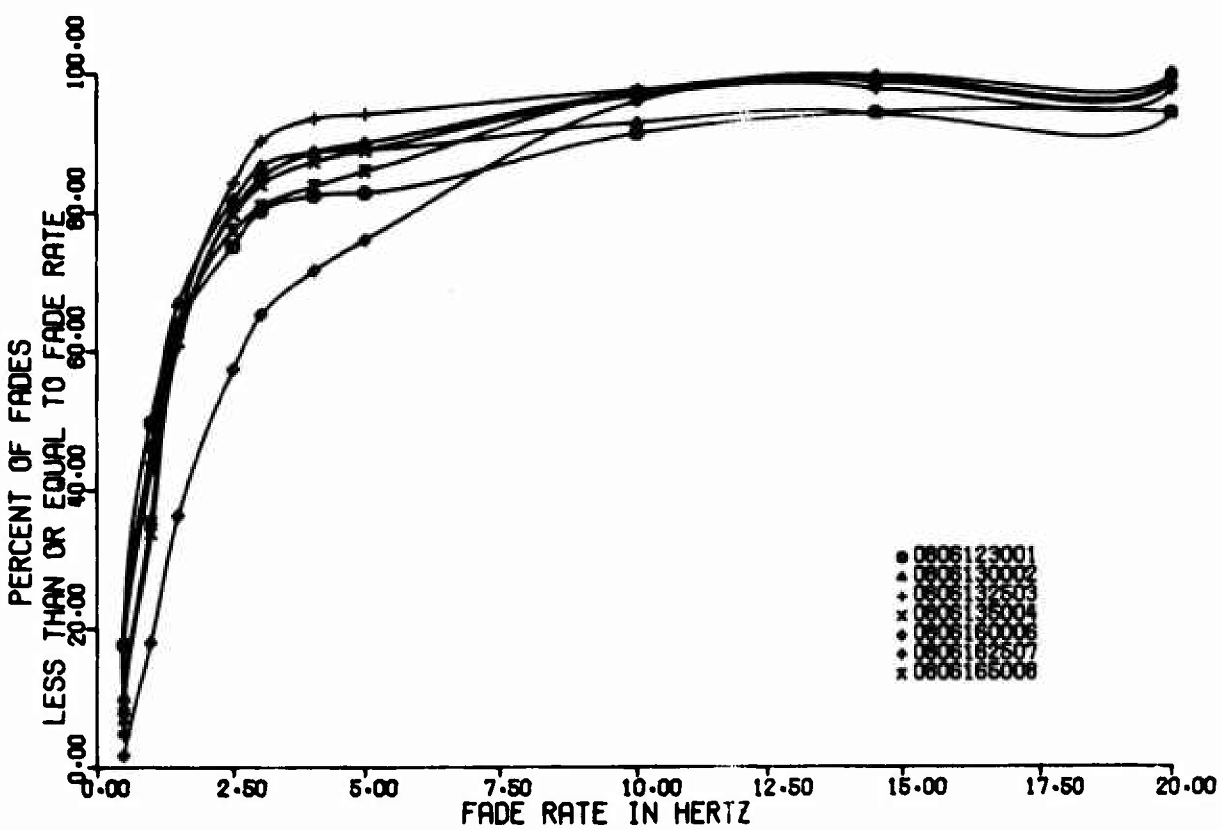


Figure 30. Fade Rate Distribution
Ontario Center, Summer; C-Band

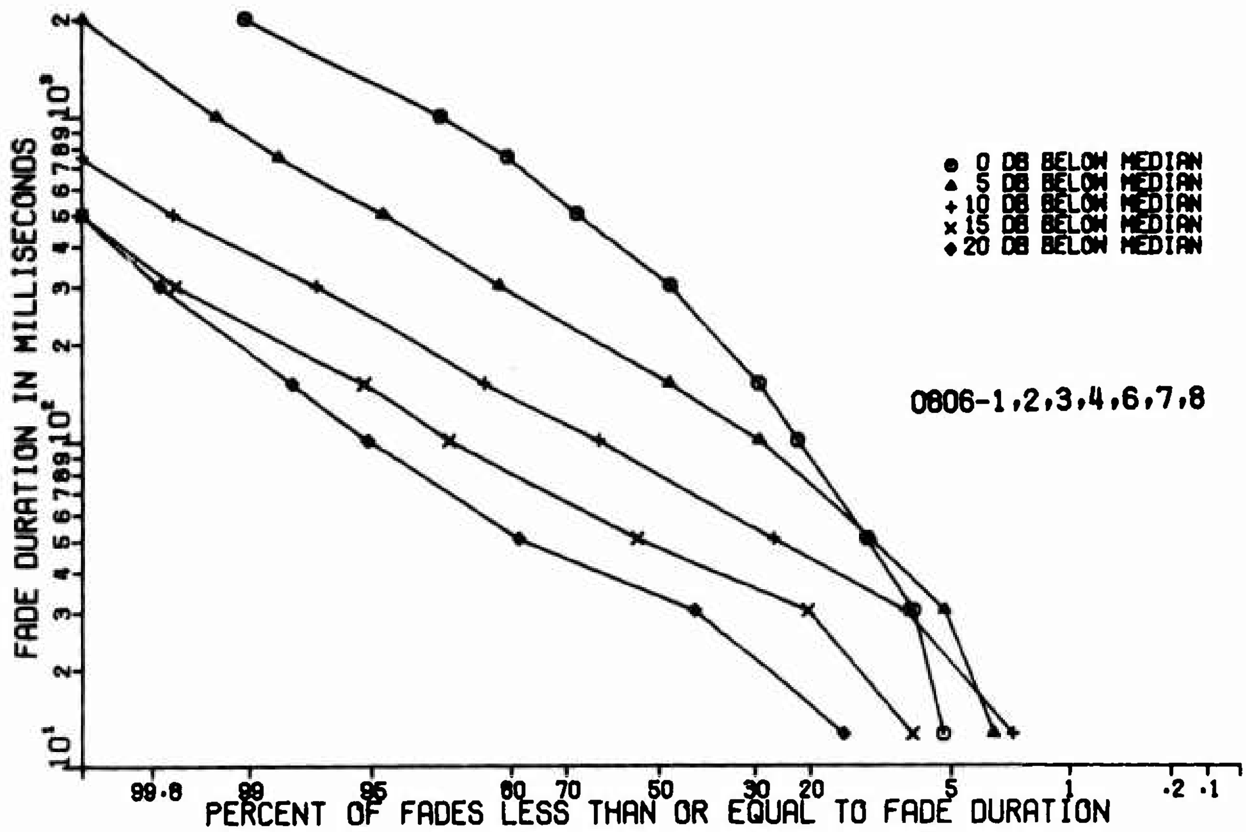


Figure 31. Distribution of Fade Duration
Ontario Center, Summer; C-Band

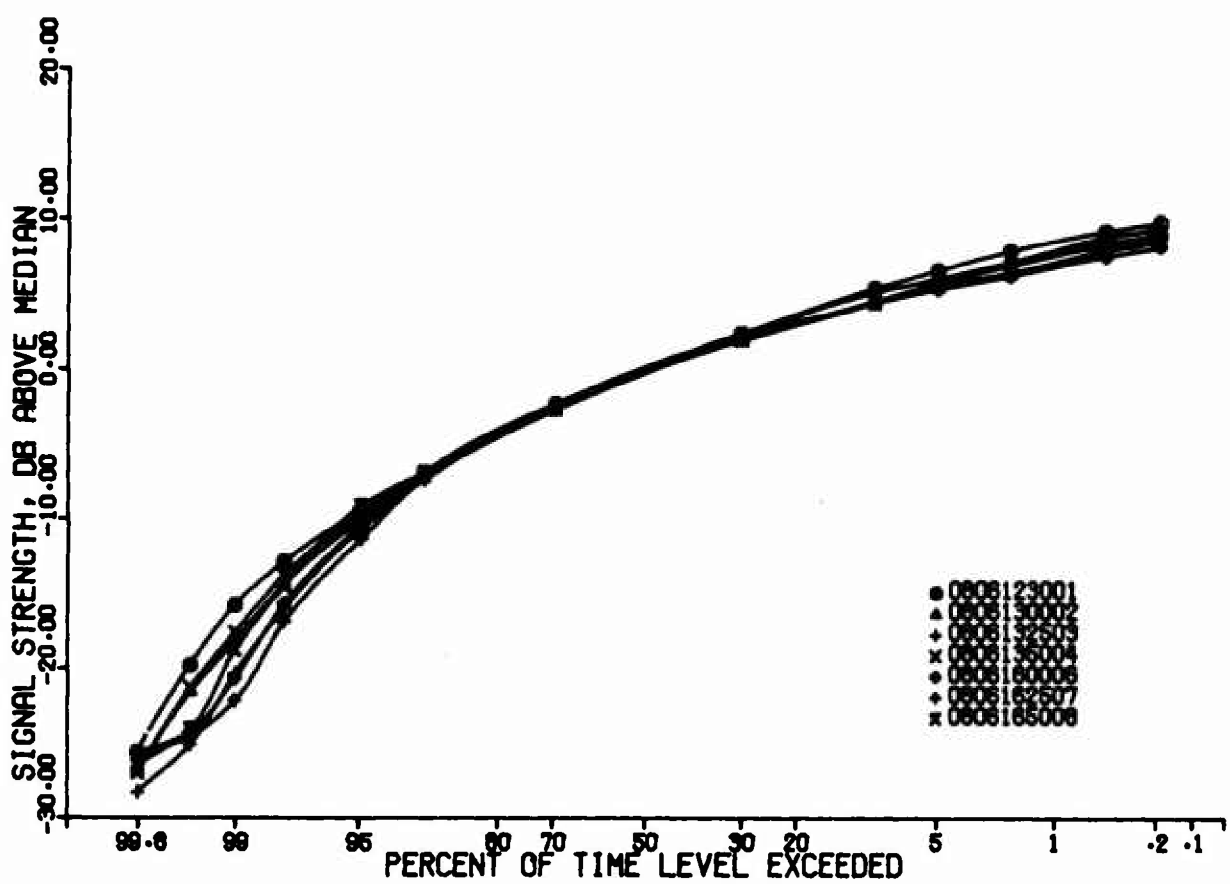


Figure 32. Signal Amplitude Level
Ontario Center, Summer; C-Band

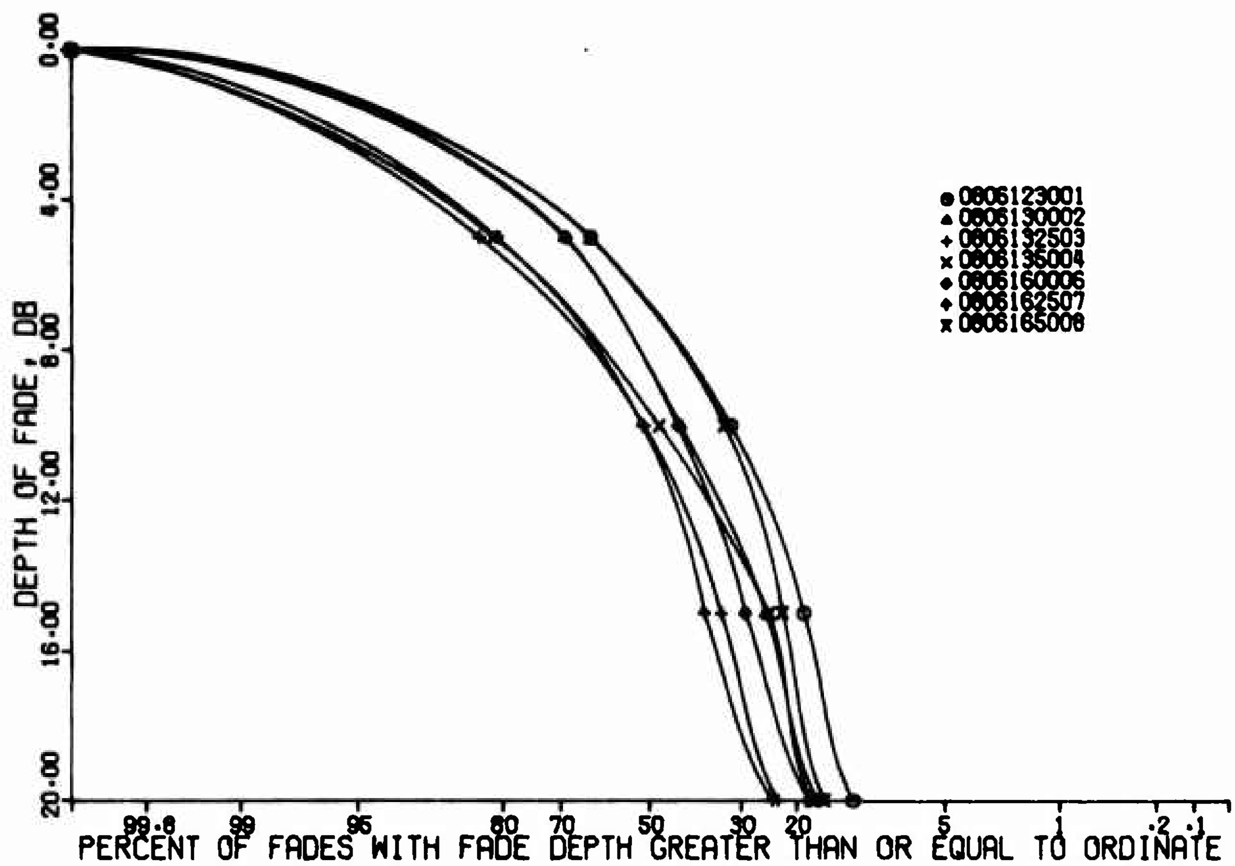


Figure 33. Distribution of Depth of Fades
Ontario Center, Summer; C-Band

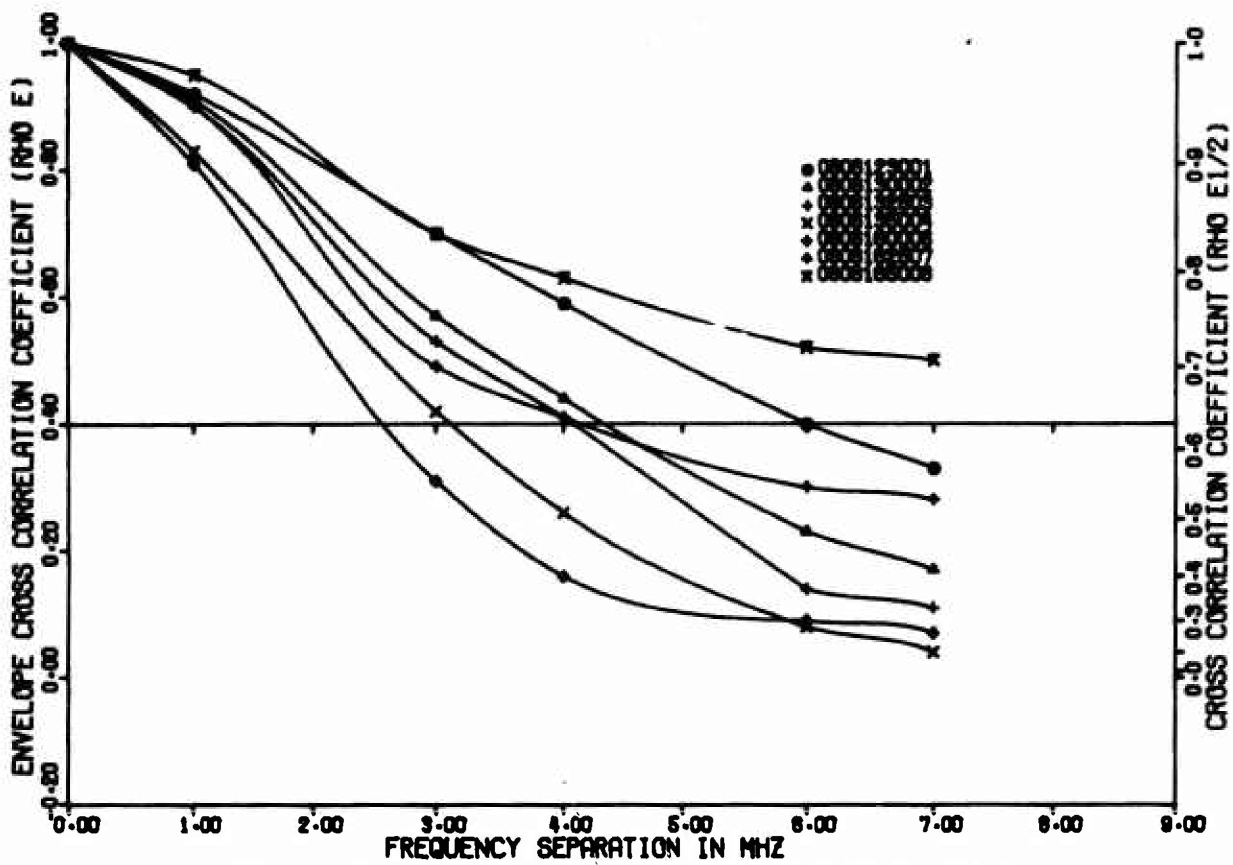


Figure 34. Envelope Cross Correlation Coefficients
Ontario Center, Summer; X-Band, Wide

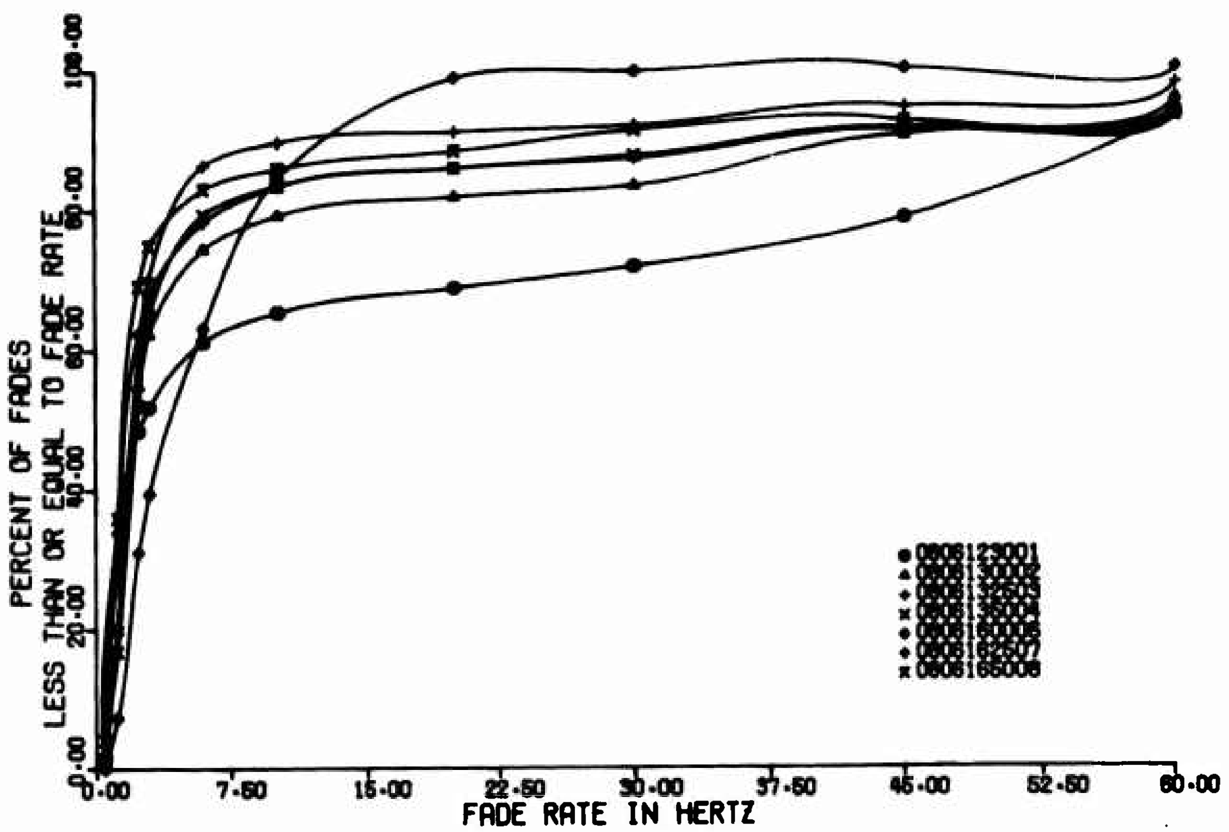


Figure 35. Fade Rate Distribution
Ontario Center, Summer; X-Band

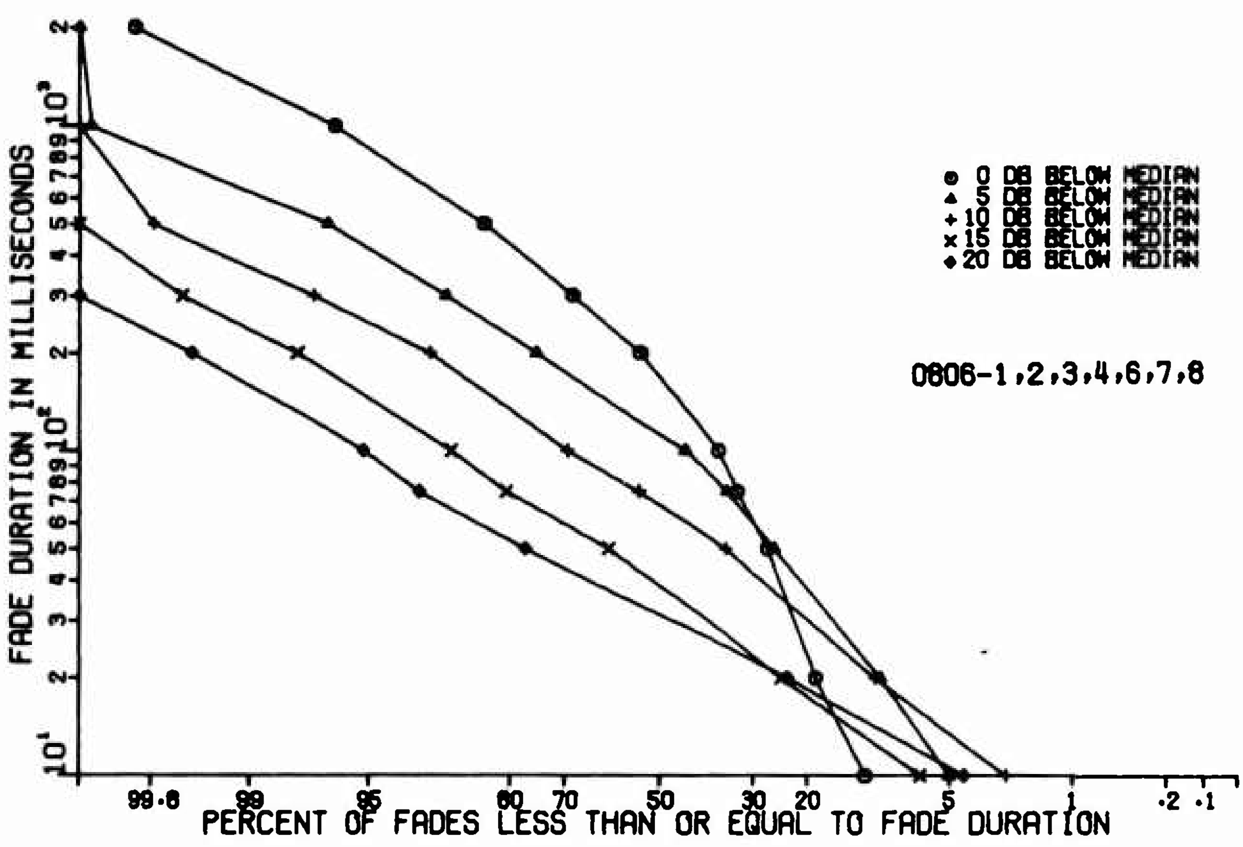


Figure 36. Distribution of Fade Duration
Ontario Center, Summer; X-Band

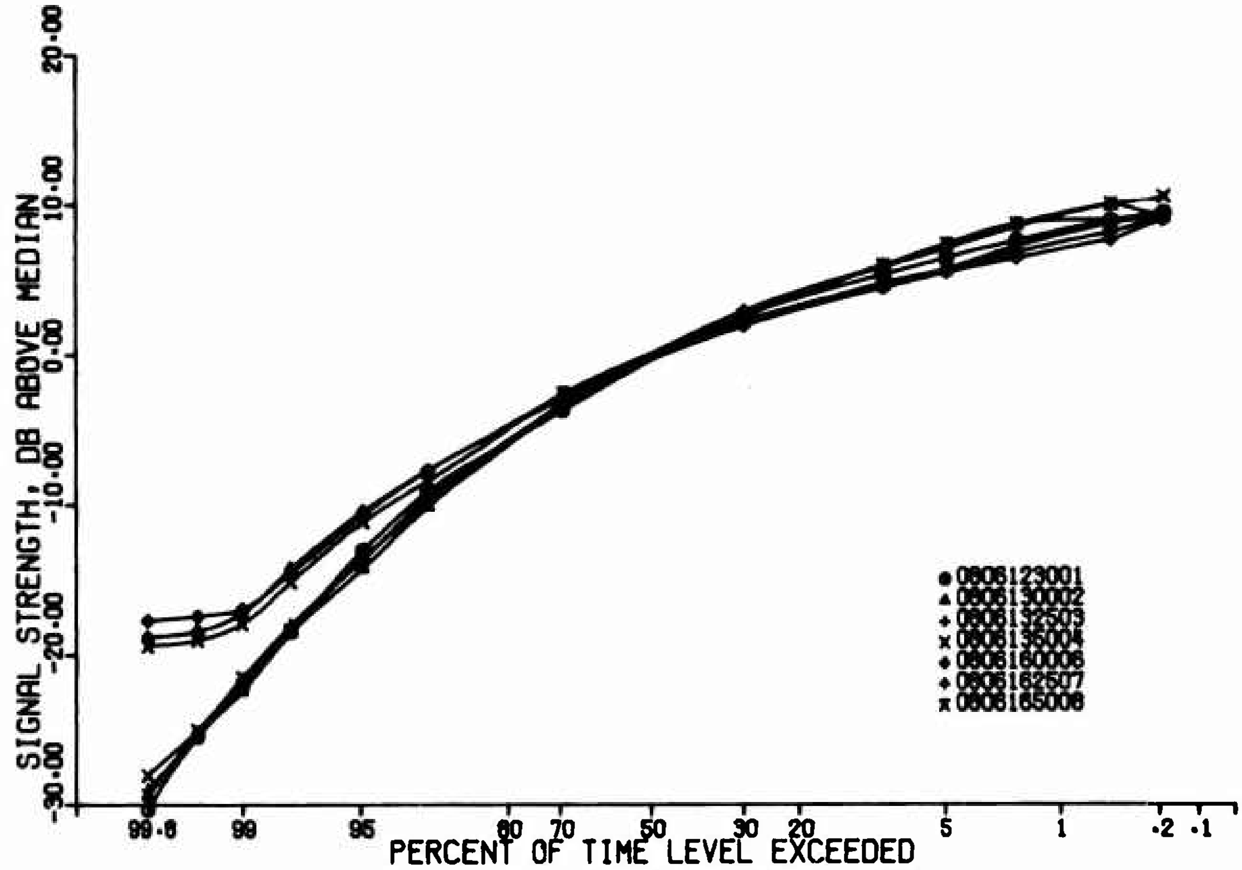


Figure 37. Signal Amplitude Level
Ontario Center, Summer; X-Band

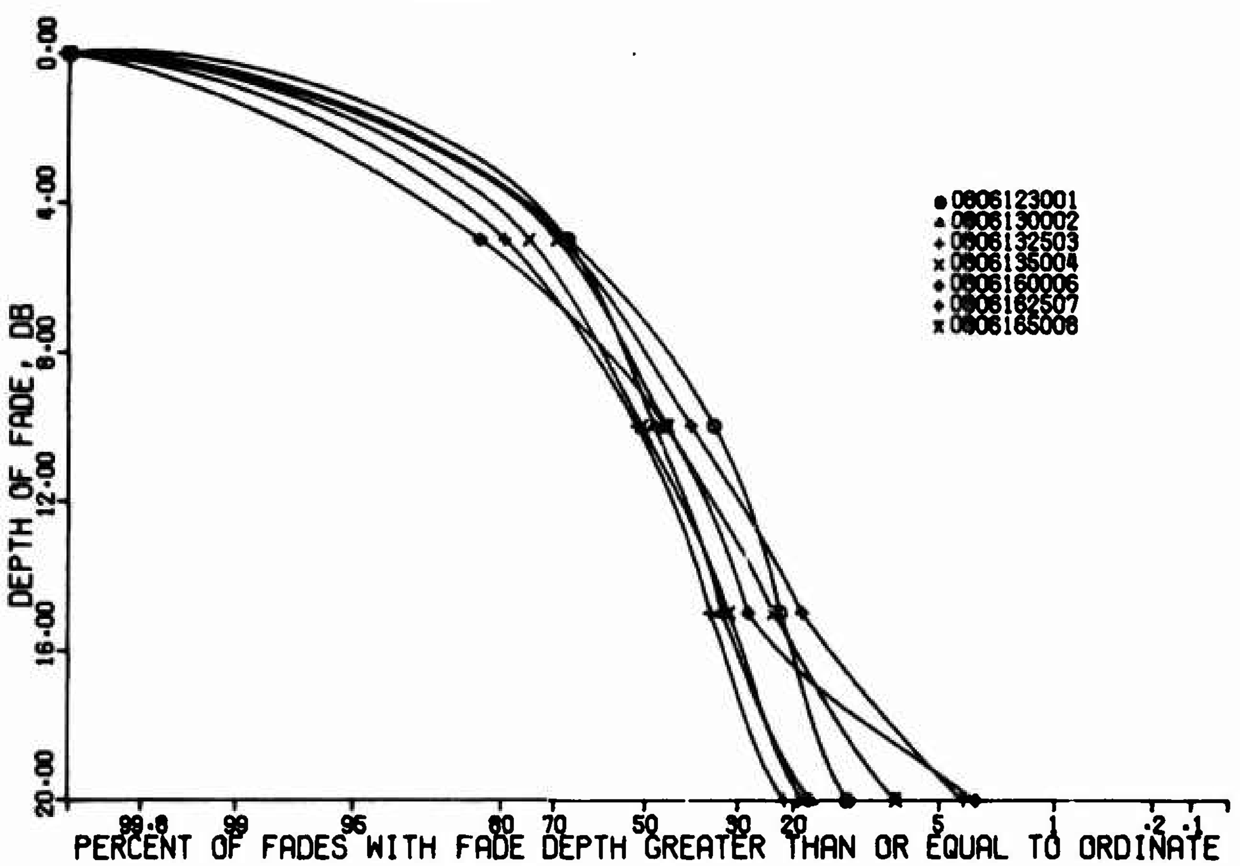


Figure 38. Distribution of Depth of Fades
Ontario Center, Summer; X-Band

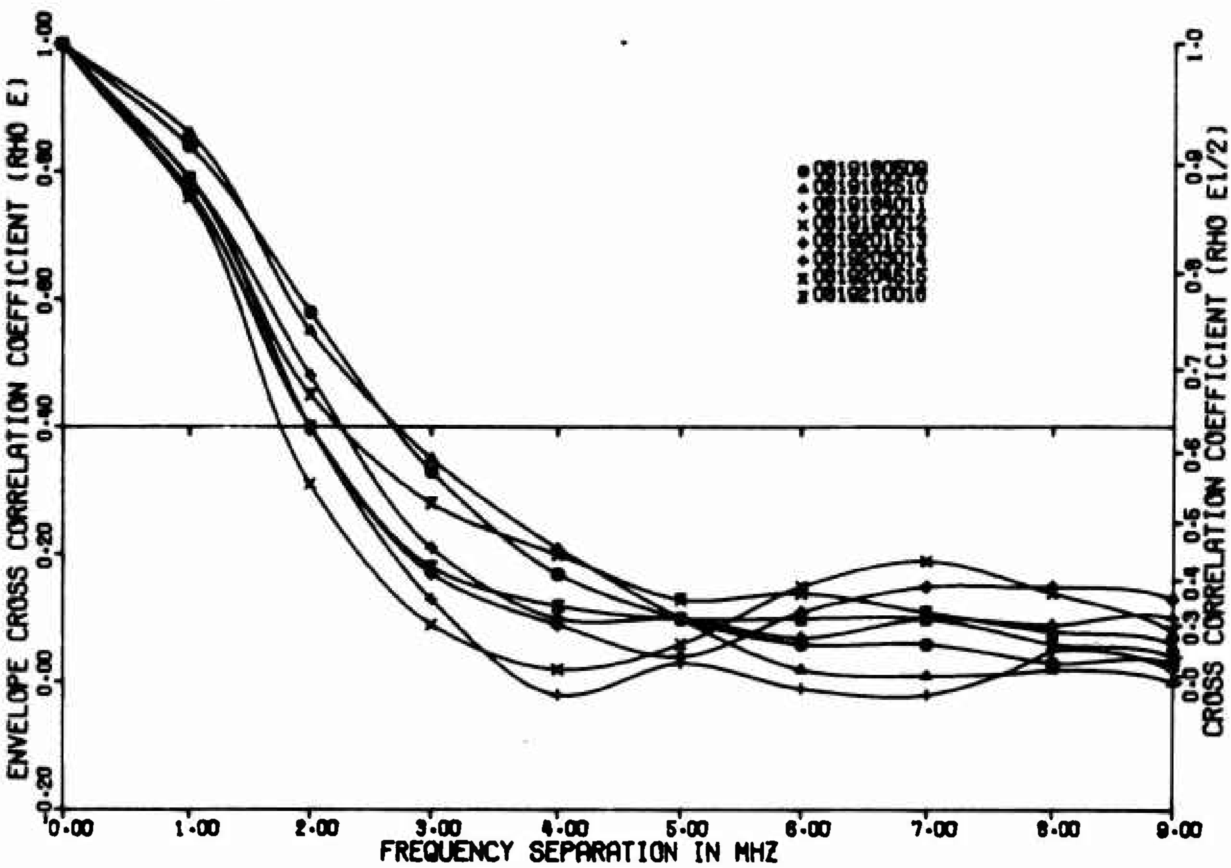


Figure 39. Envelope Cross Correlation Coefficients
Ontario Center, Summer; C-Band, Wide

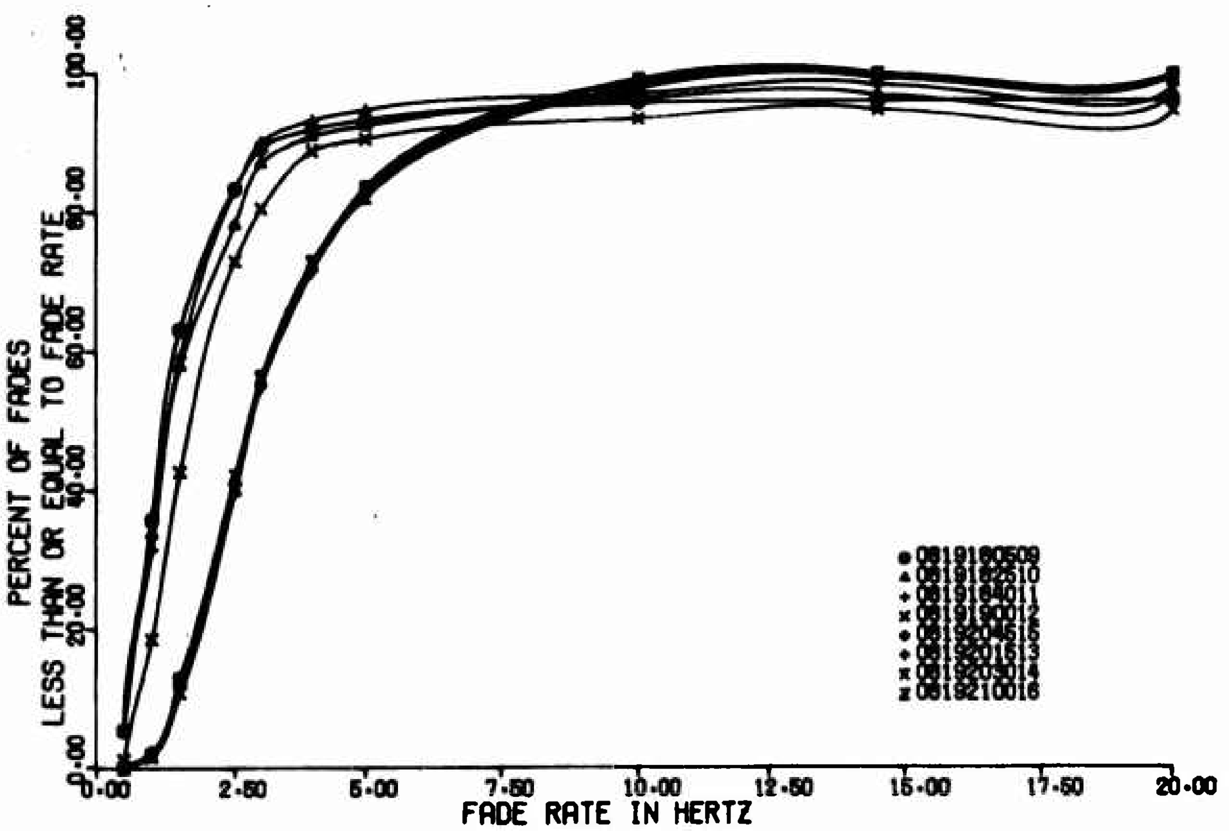


Figure 40. Fade Rate Distribution
Ontario Center, Summer; C-Band

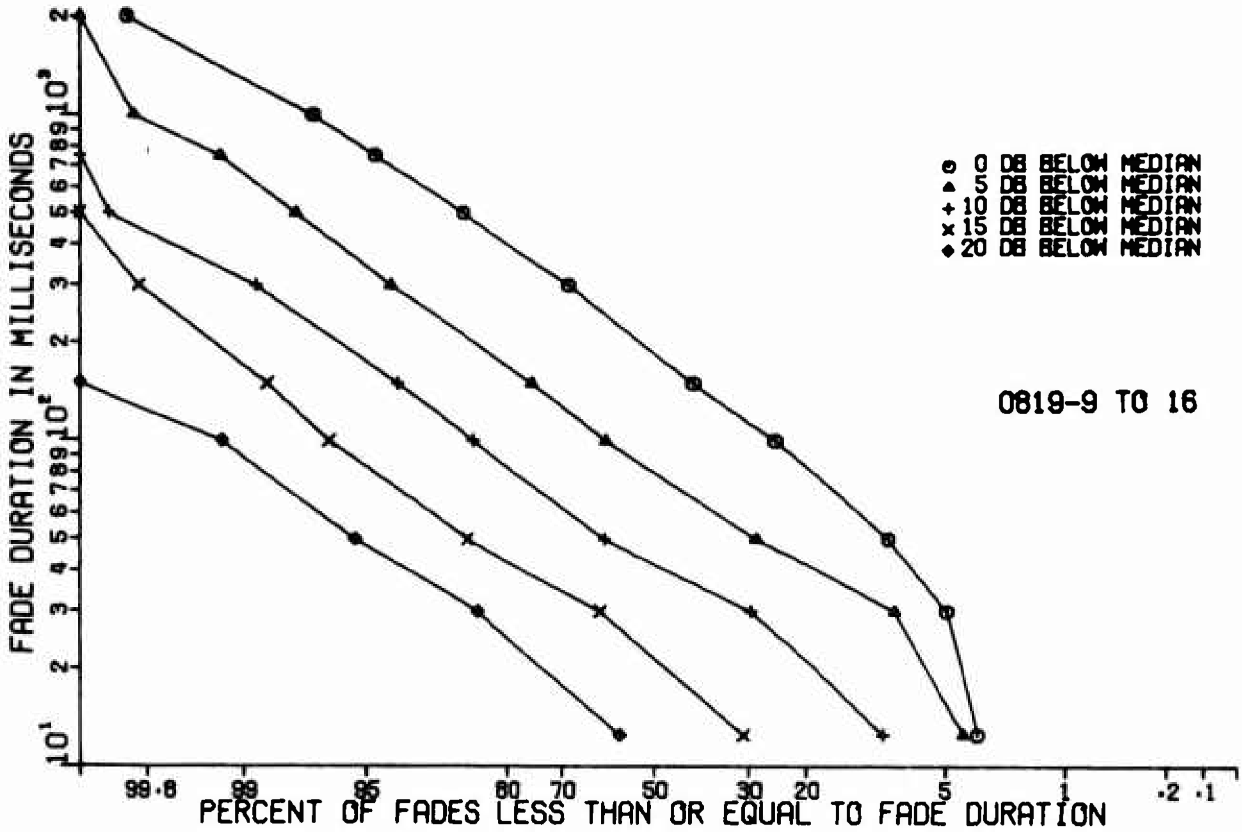


Figure 41. Distribution of Fade Duration
Ontario Center, Summer; C-Band

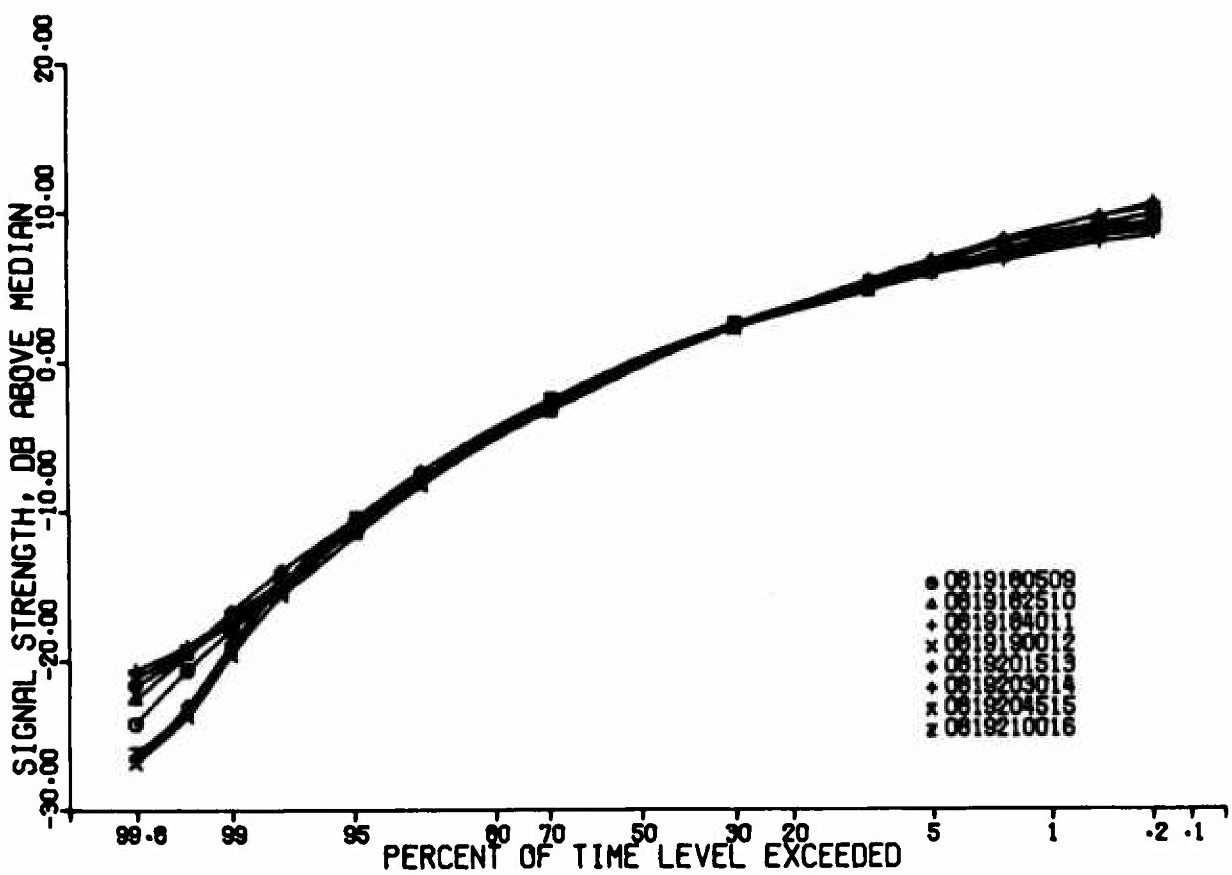


Figure 42. Signal Amplitude Level
Ontario Center, Summer; C-Band

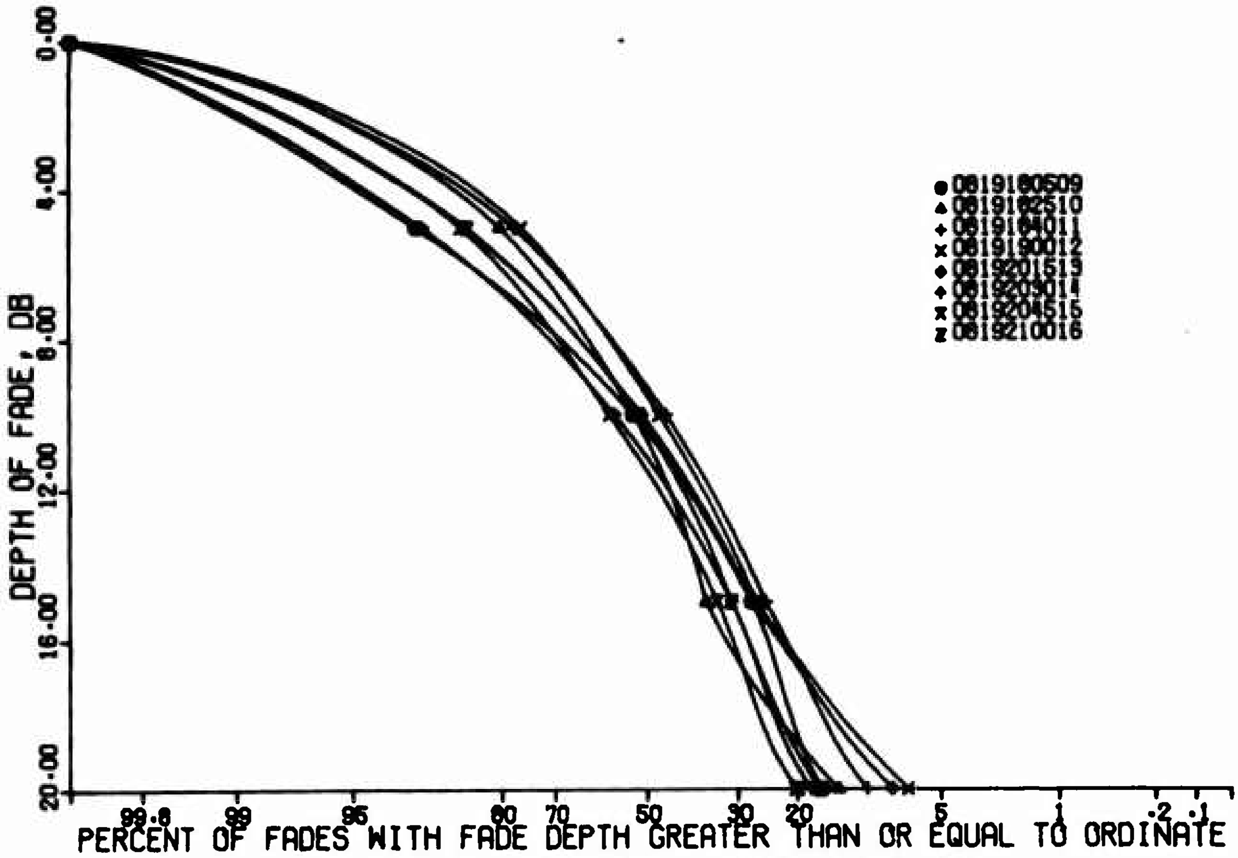


Figure 43. Distribution of Depth of Fades
Ontario Center, Summer; C-Band

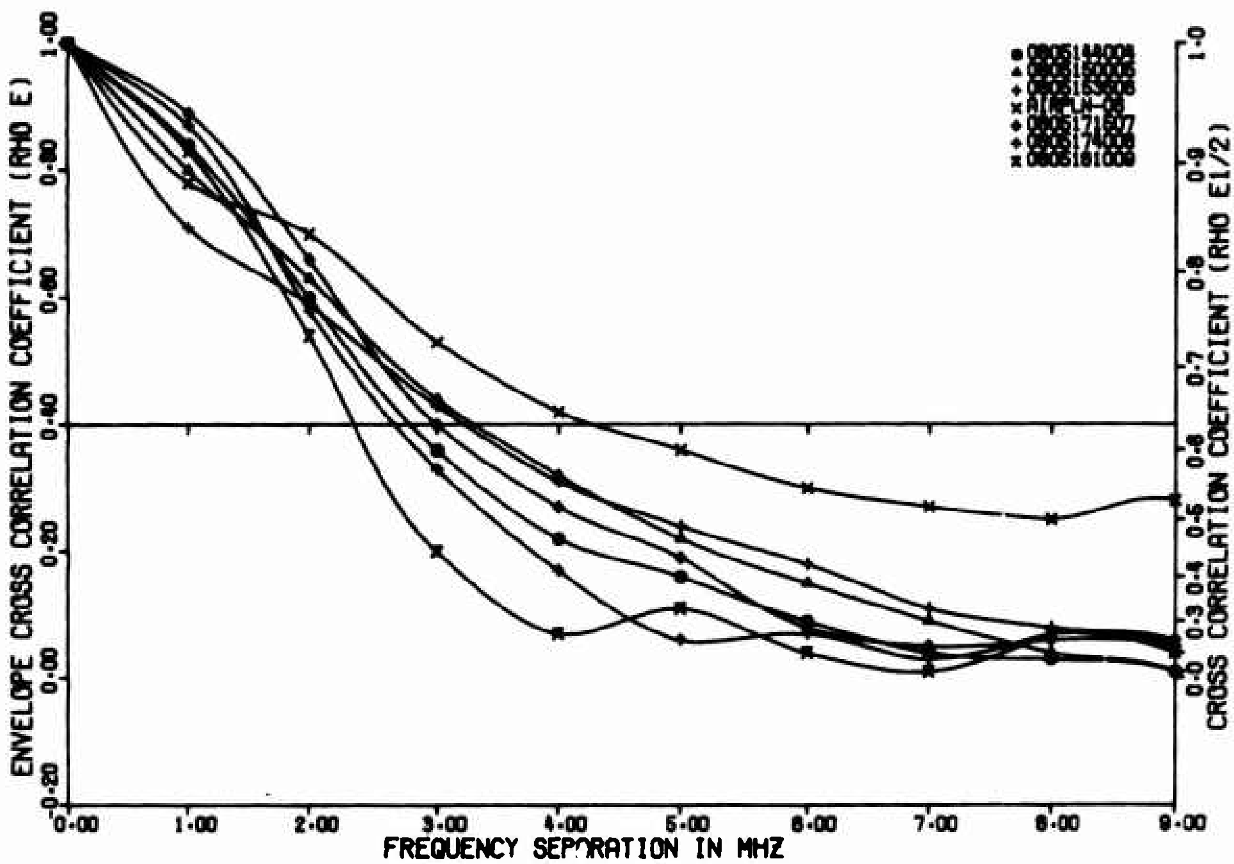


Figure 44. Envelope Cross Correlation Coefficients
Ontario Center, Summer; C-Band, Wide

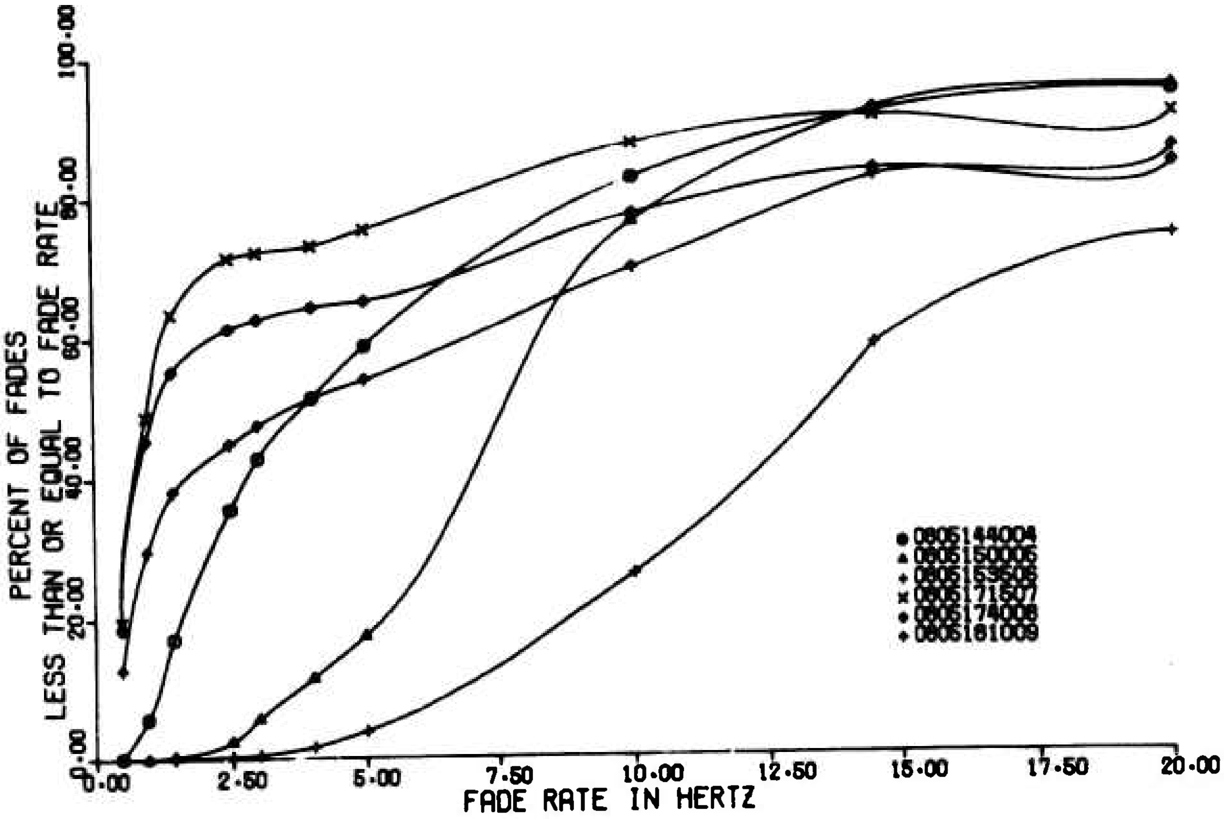


Figure 45. Fade Rate Distribution
Ontario Center, Summer; C-Band

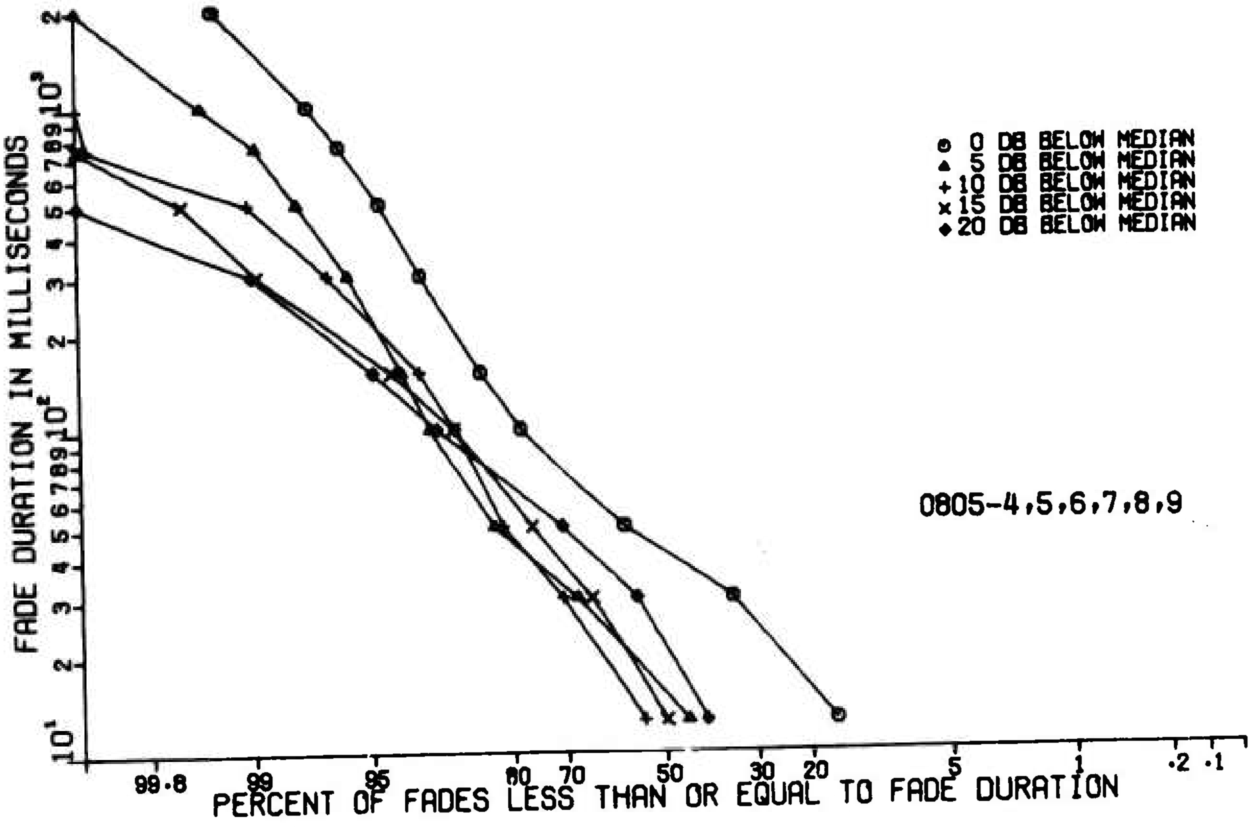


Figure 46. Distribution of Fade Duration
Ontario Center, Summer; C-Band

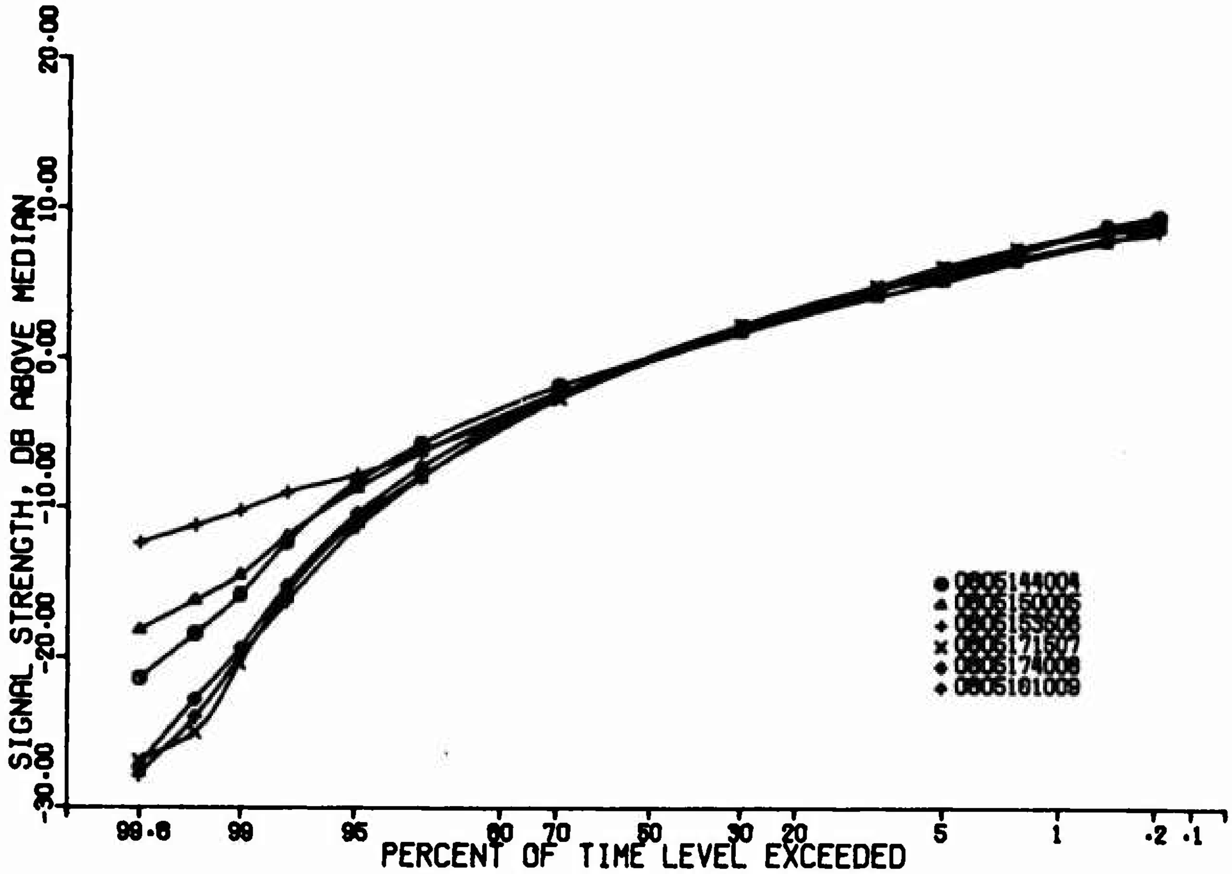


Figure 47. Signal Amplitude Level
Ontario Center, Summer; C-Band

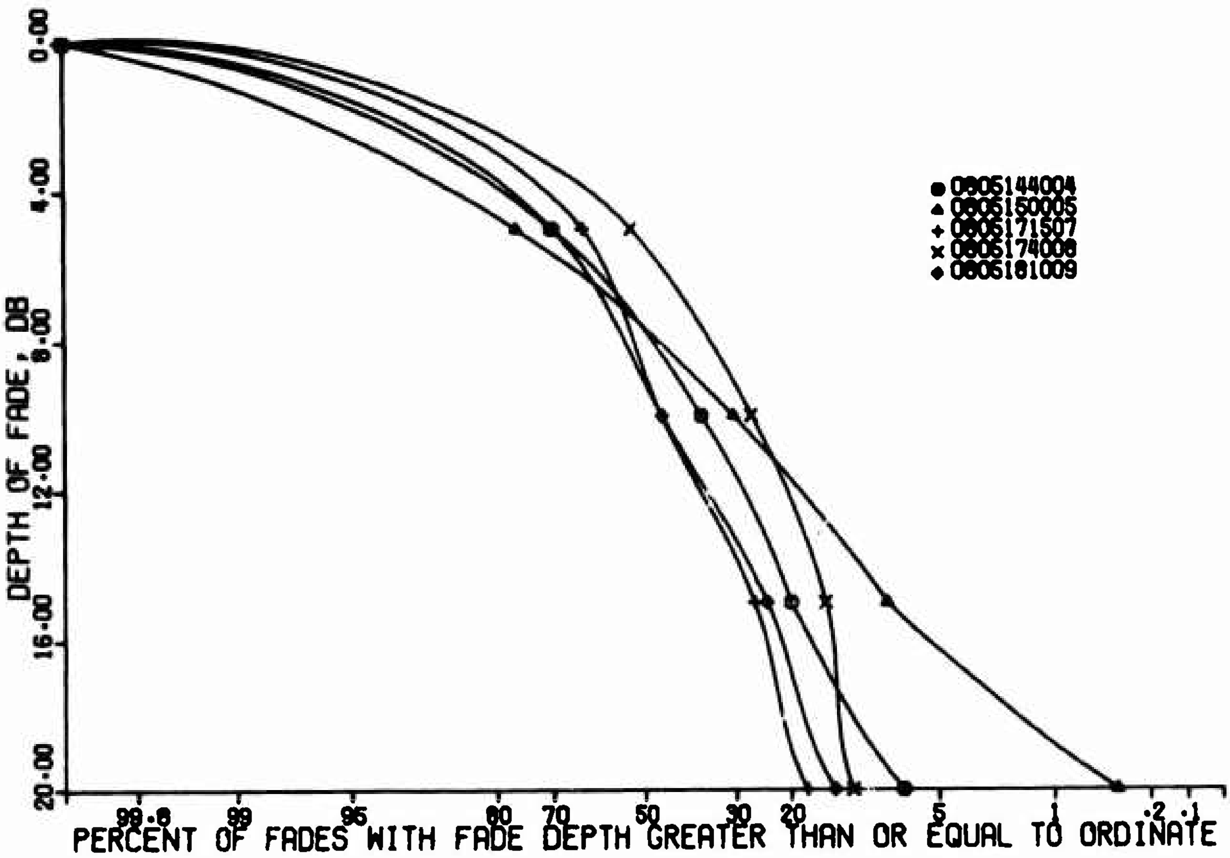


Figure 48. Distribution of Depth of Fades
Ontario Center, Summer; C-Band

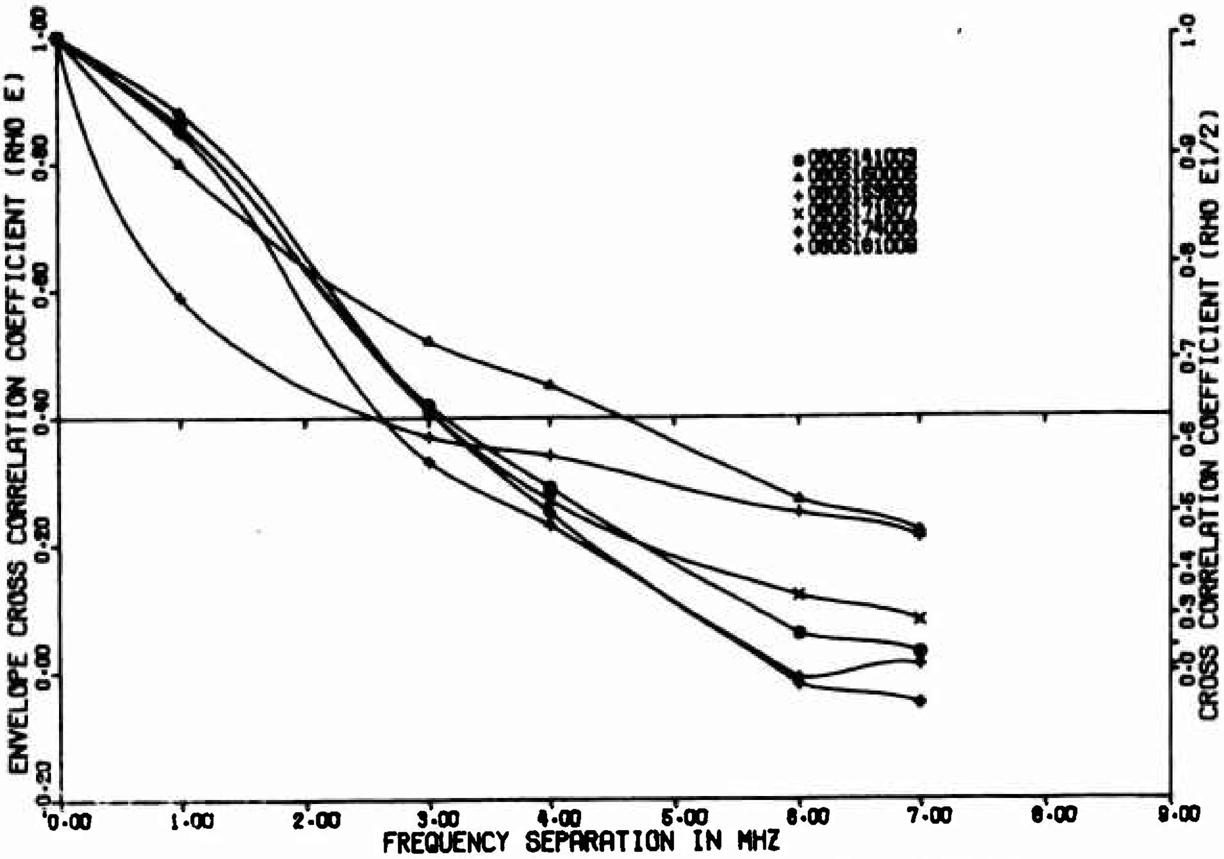


Figure 49. Envelope Cross Correlation Coefficients
Ontario Center, Summer; X-Band, Wide

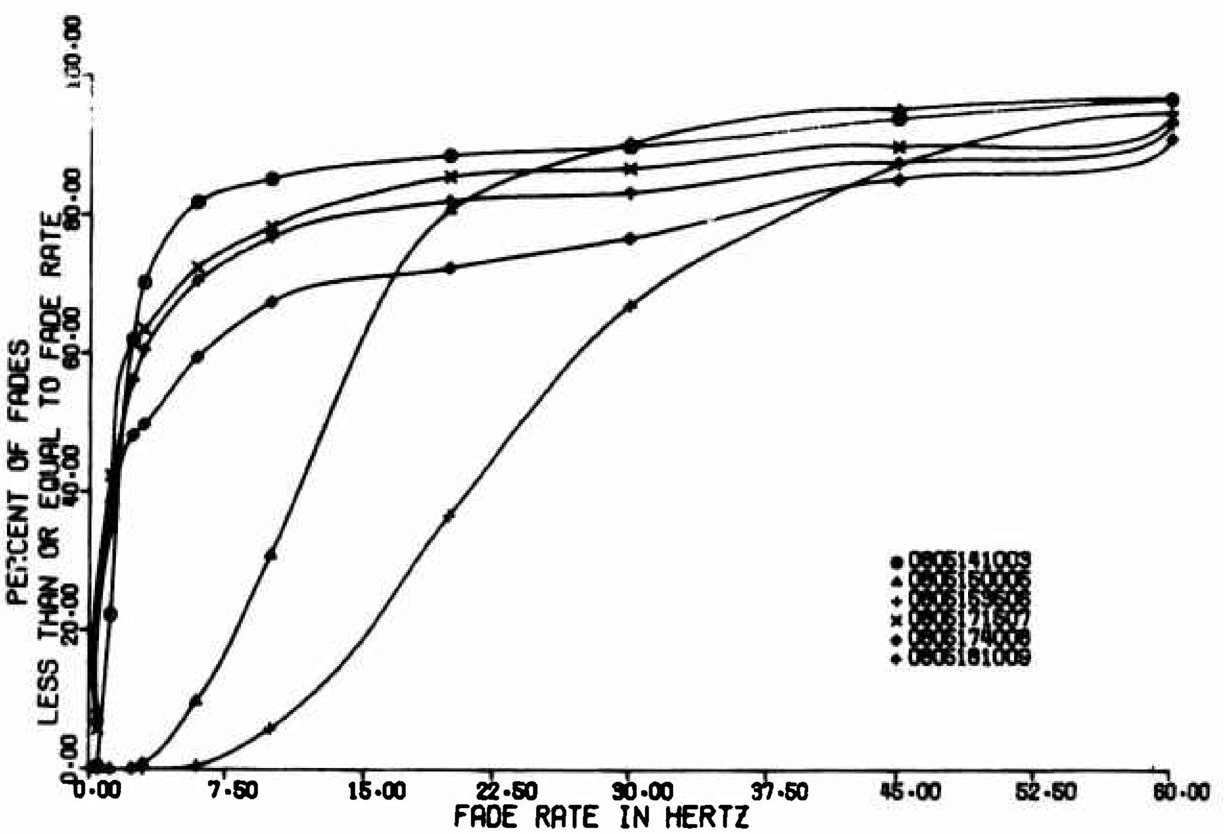


Figure 50. Fade Rate Distribution
Ontario Center, Summer; X-Band

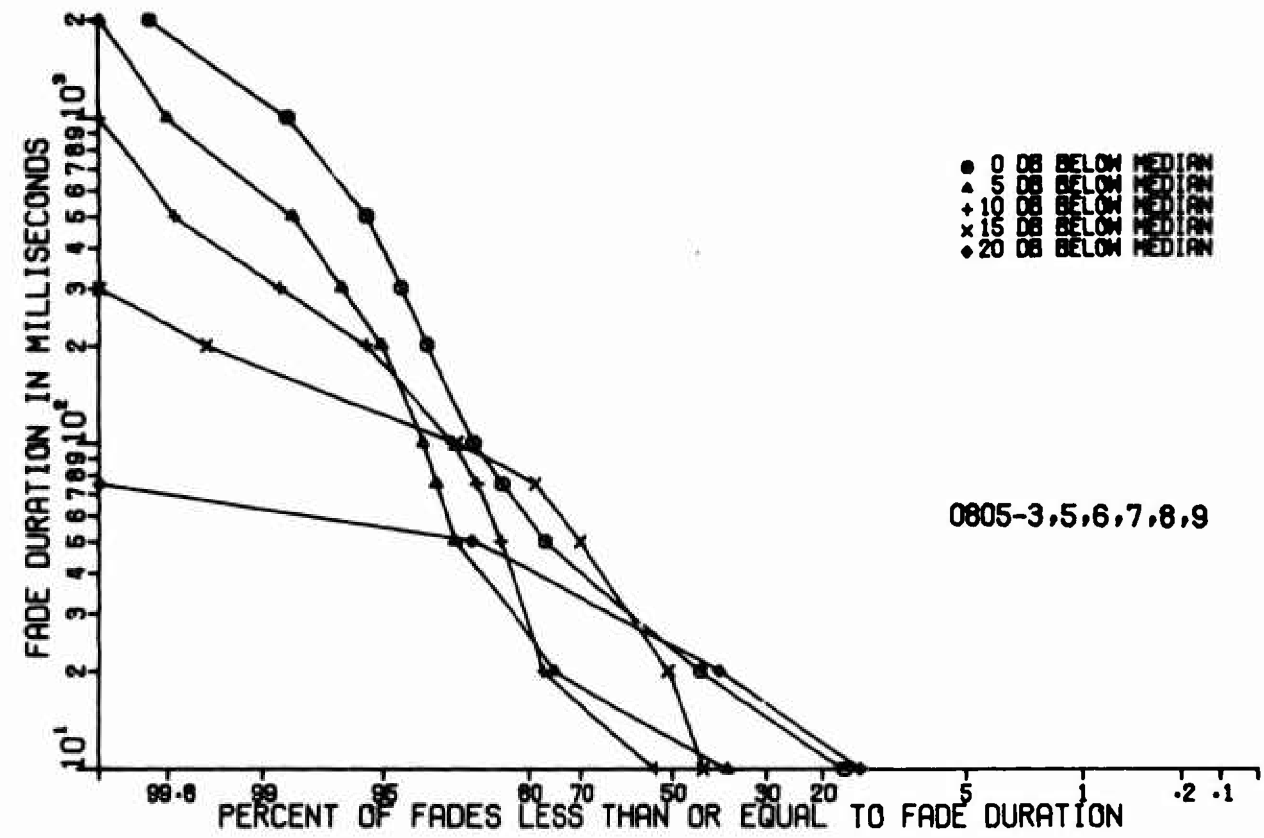


Figure 51. Distribution of Fade Duration
Ontario Center, Summer; X-Band

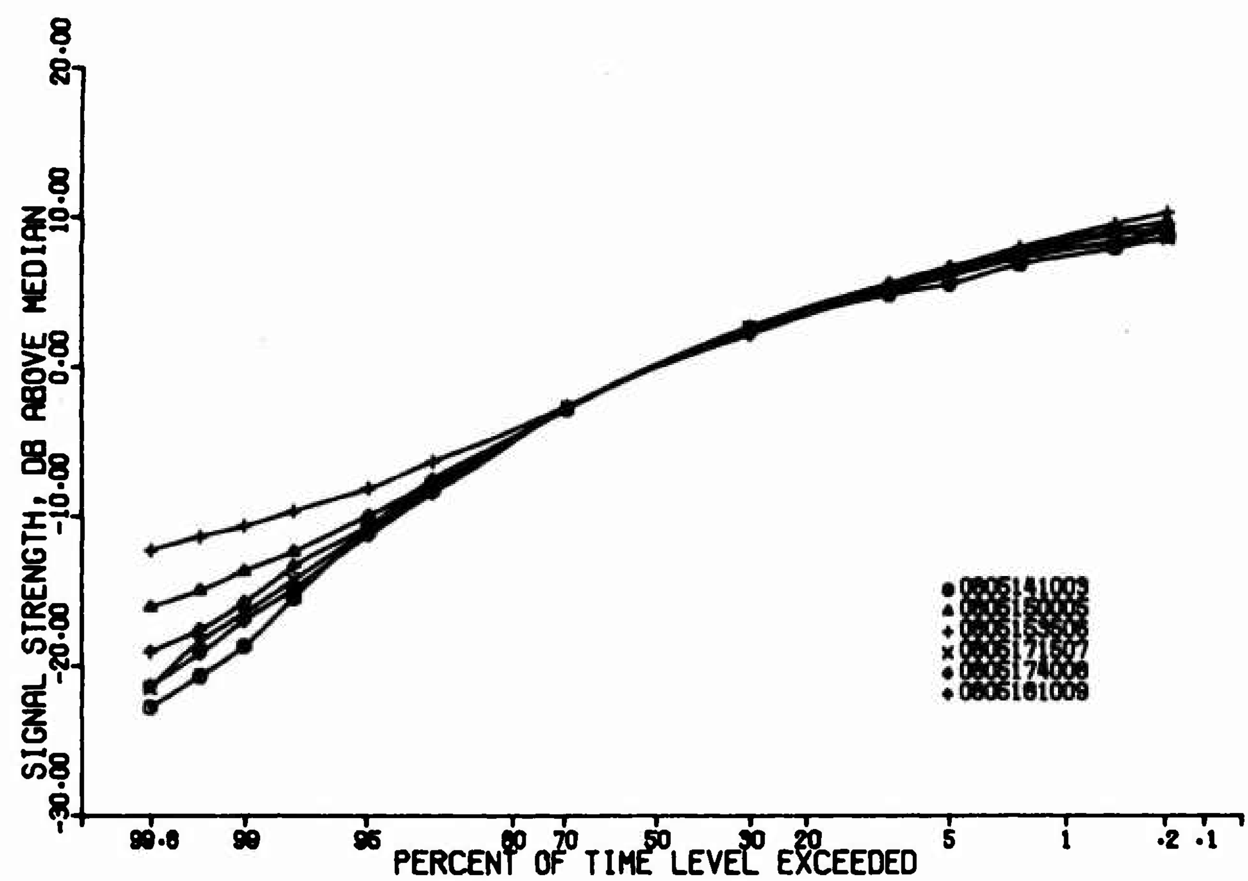


Figure 52. Signal Amplitude Level
Ontario Center, Summer; X-Band

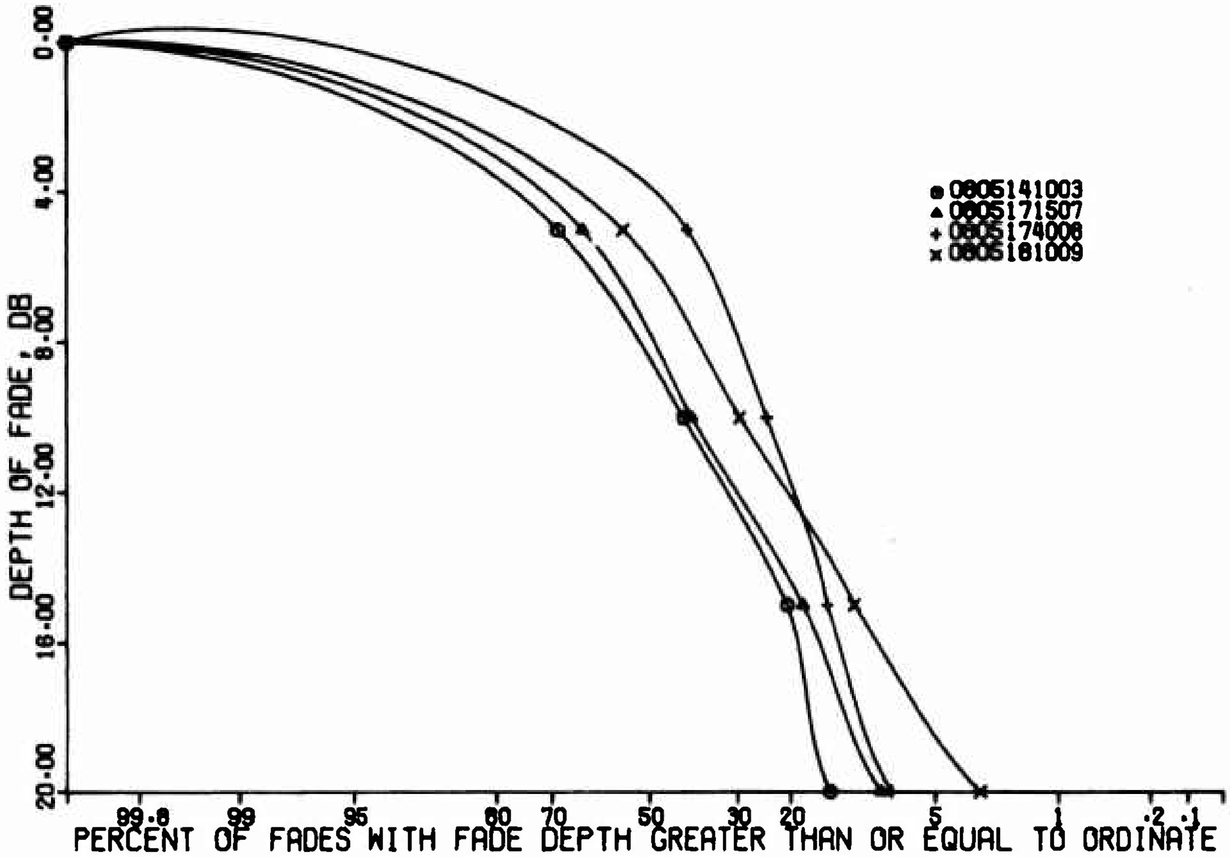


Figure 53. Distribution of Depth of Fades
Ontario Center, Summer; X-Band

2. Whitford Field, Weedsport, N. Y.

The summer data at Whitford Field can be characterized by the narrowness of the correlation bandwidth as compared to the short Ontario Center path. This is to be expected on the longest path (200 km). The widest bandwidths where the envelope cross correlation coefficient goes from 1.0 to 0.4 is about 3.5 MHz for both C and X bands. The fade rates are usually slower than the Ontario Center path, but some of the tests showed high rates with median values of 10 Hz at C band and about the same at X band. The narrowest correlation bandwidths were about 1 MHz for both frequencies.

There was some concern over the low signal strengths available at this site and the effect it might have on the measured values of the cross correlation coefficients. A special test was made using receivers with a noise threshold of 135 dBm and a channel spacing of 500 kHz by FM at a modulation index of 1.84 at the transmitter. The cross correlation coefficients were measured by this method and by the regular wide band method. The results plotted in Figure 54 indicate that the signal strength and lack of fade margin do not affect the correlation bandwidth calculated, for the 200 kHz spaced curves nearly coincide with the 1 MHz spaced curves.

A typical set of measurements that indicate the more narrow cross correlation coefficients are shown in Figures 55 through 59 for C band. There are limited fade statistics for the durations, etc., due to the low fade margin on this path. A set of wider correlation bandwidths (Figures 60 and 61) for C band indicate that 2.5 to 3.5 MHz is typically the widest obtained during this test period.

X- and C-band results can be compared directly in the test results of 29 August tests number 14 through 16 (Figures 62 through 67). The X and C bandwidths are test by test very nearly the same. Test 14 has an X-band median fade rate of 17 Hz to the C-band 11 Hz. Test 15 has an X-band median rate of 4 Hz compared to the C-band median rate of 3 Hz. Test 16 has for X-band, 16 Hz, and 4 Hz for the C-band case. In nearly every test the X-band fade rates exceed the C-band rates while the correlation bandwidths remain about the same. This pair of observations adds evidence that the effective scatter volume in both cases is about the same, for the increase in fade rate would naturally follow a decrease in wavelength if all other things are left unchanged.

An interesting occurrence was noted in tests 3 and 5 of 28 August (Figures 68 and 69) and a similar occurrence was noted the next day in test 9 (Figure 62). This phenomenon of oscillating the cross correlation coefficient has been observed on a number of occasions. On 14 August at Ontario Center this type of phenomenon was observed to result in a function similar to sine x/x for the correlation coefficient versus frequency (see section IV-E).

The phenomenon of ducting was never noticed at this site during the summer tests. This does not imply that it cannot happen on the Whitford site; it just did not occur during the time tests were being performed.

The Whitford summer data can be summed up as being of low signal strength with relatively narrow correlation bandwidths and slow fades when compared with the Ontario Center data. The correlation bandwidth reduction does result in a small improvement in frequency diversity modems, but not to any outstanding extent, for it has been determined in a previous MALLARD program (Reference 2) that the most significant diversity improvement . ; obtained when the correlation coefficient drops from 1.0 to about 0.7; thereafter practically no improvement is made. The fade rates are still high enough to cause problems in adaptive frequency modems, but this high rate is much rarer on this path than on the Ontario Center path.

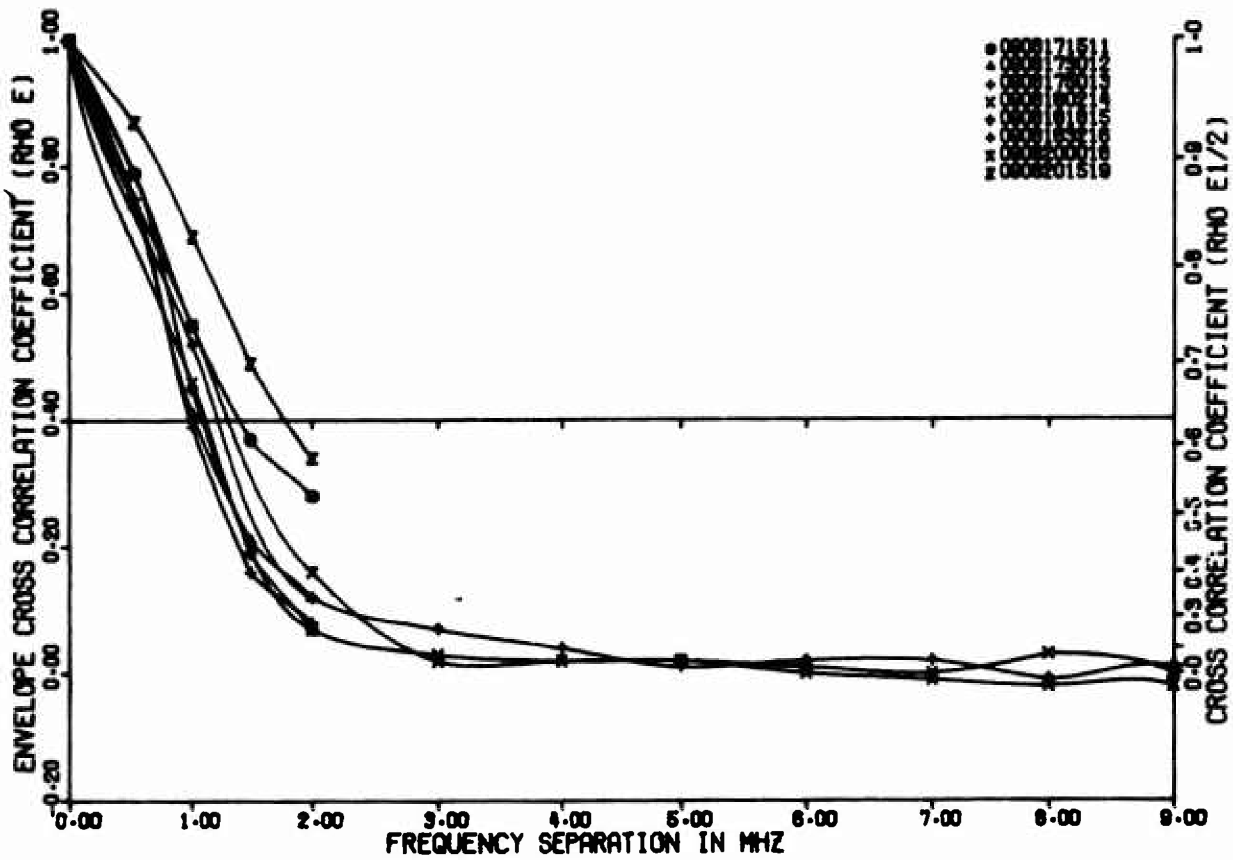


Figure 54. Envelope Cross Correlation Coefficients
Whitford Field, Summer; C-Band, 500 kc and Wide Spacing

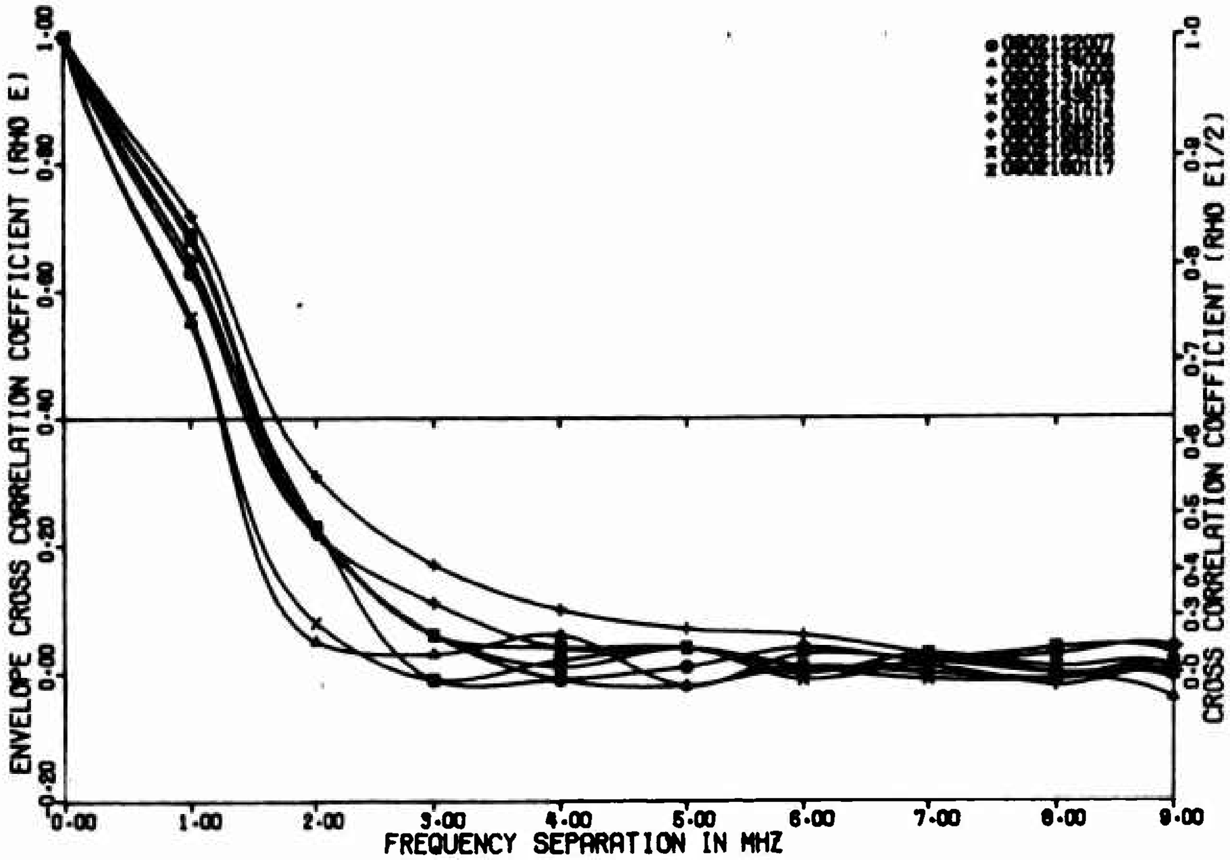


Figure 55. Envelope Cross Correlation Coefficients
Whitford Field, Summer; C-Band, Wide

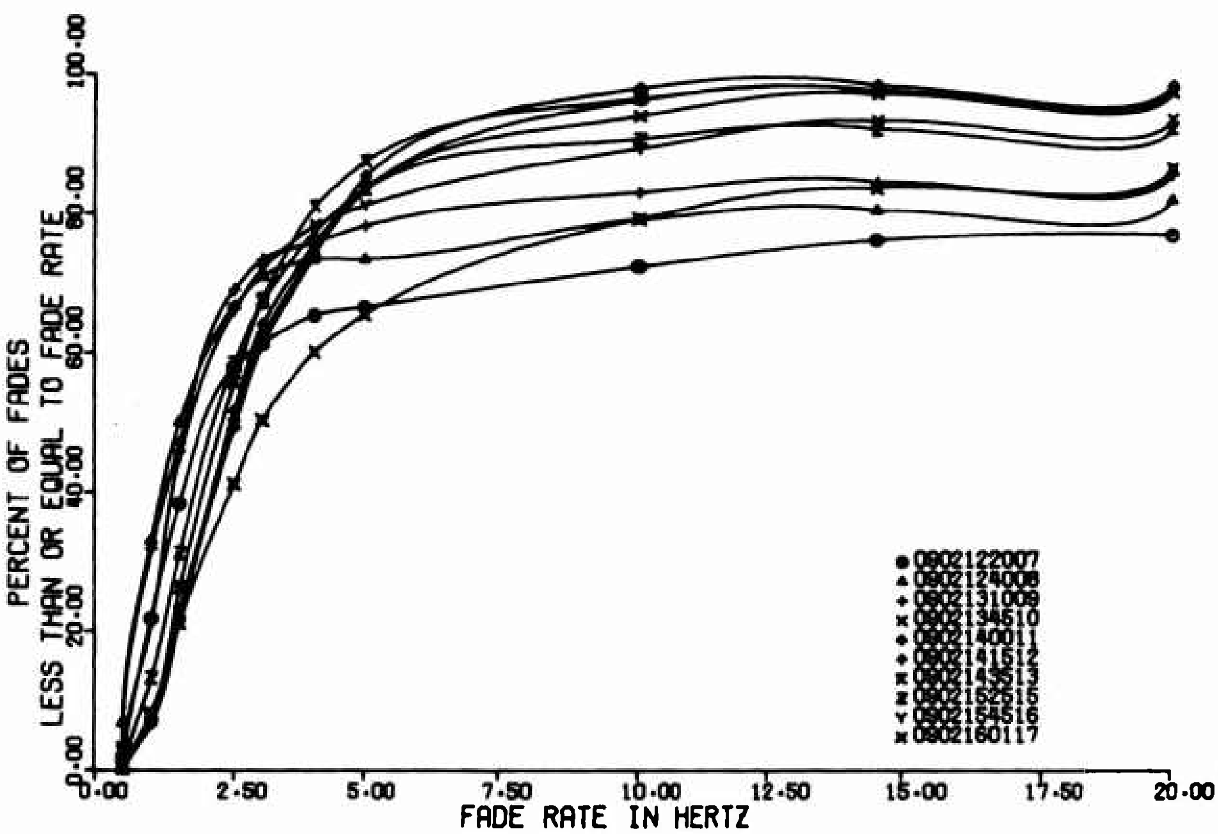


Figure 56. Fade Rate Distribution
Whitford Field, Summer; C-Band

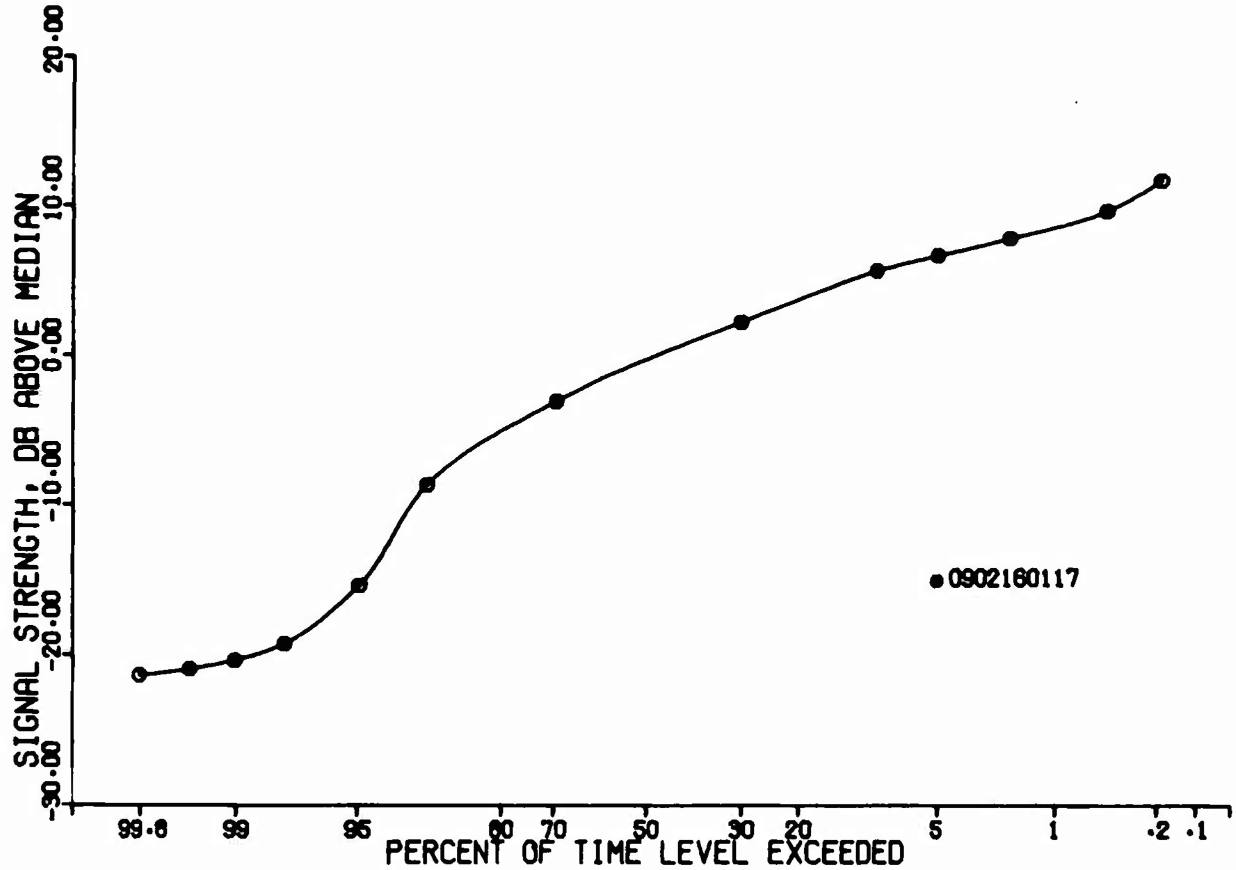


Figure 57. Signal Amplitude Level
Whitford Field, Summer; C-Band

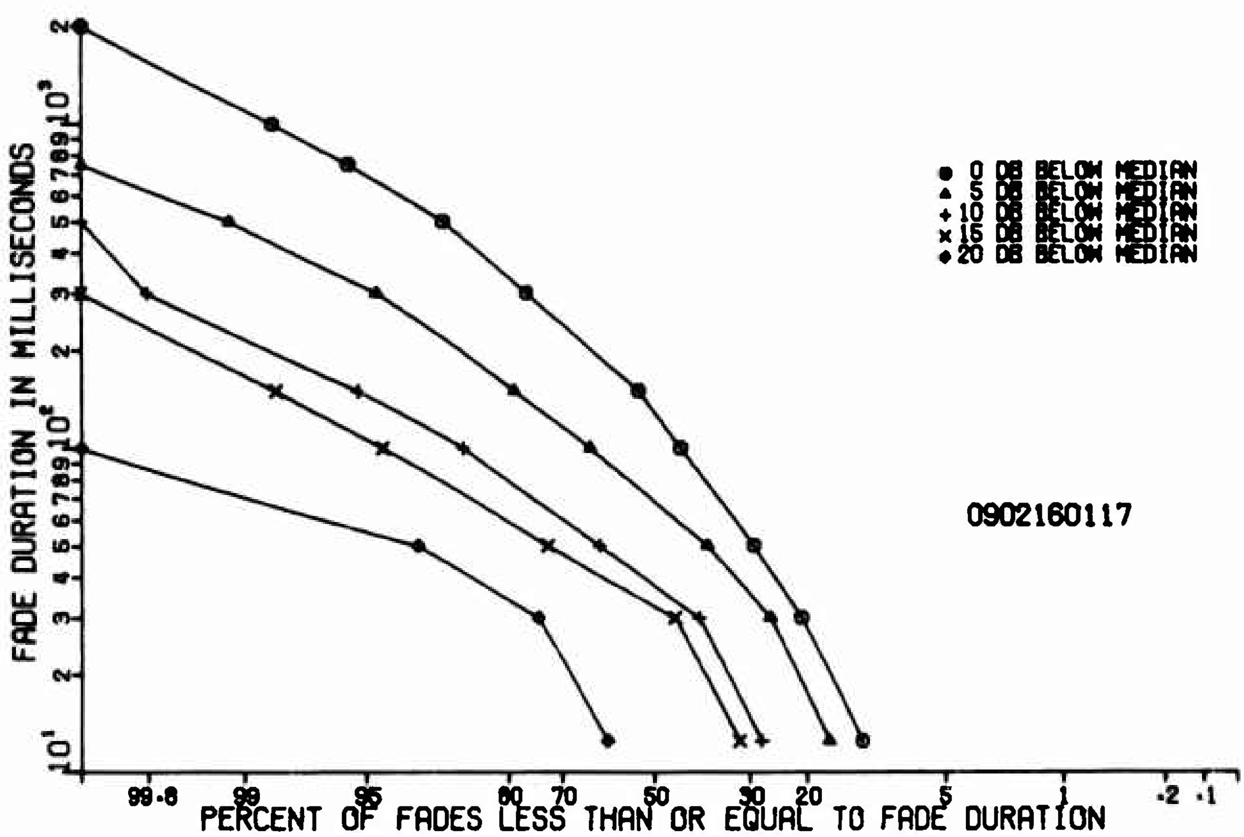


Figure 58. Distribution of Fade Duration
Whitford Field, Summer; C-Band

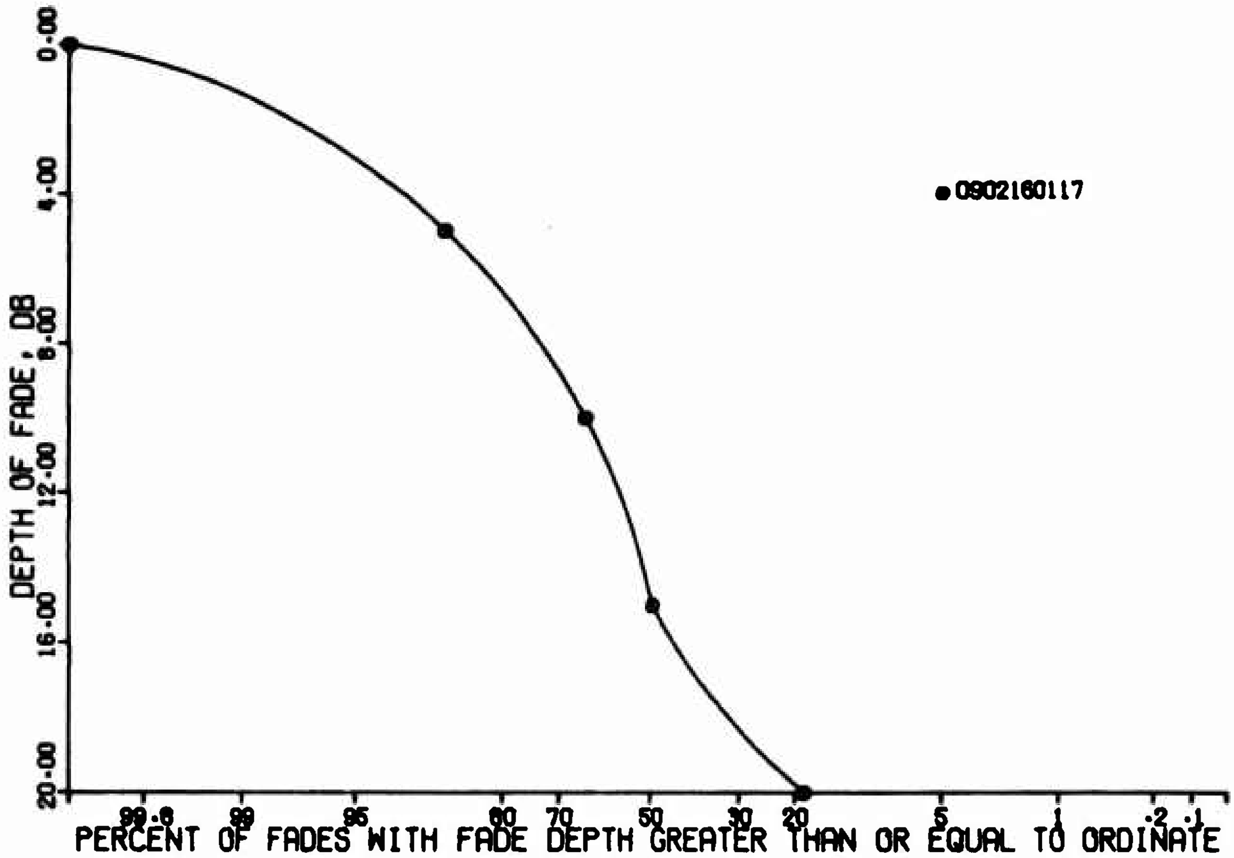


Figure 59. Distribution of Depth of Fades
Whitford Field, Summer; C-Band

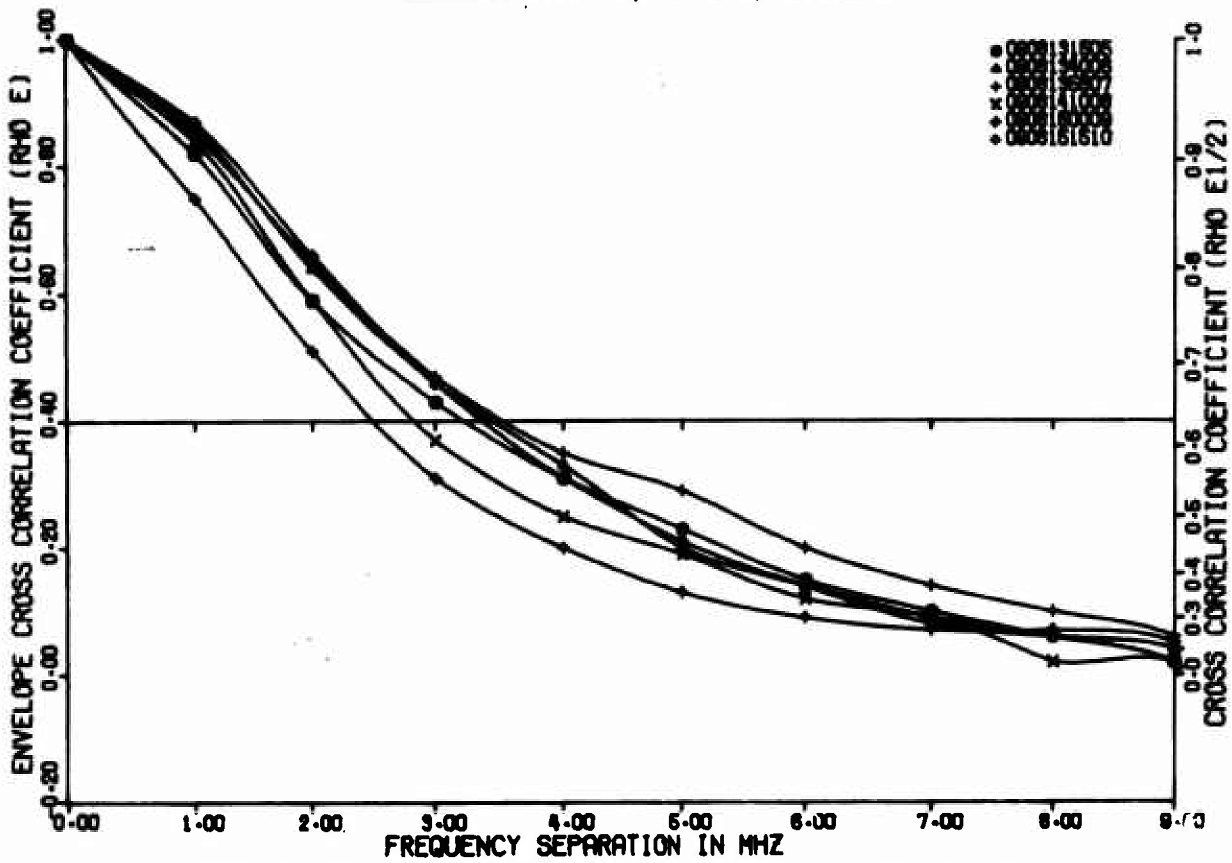


Figure 60. Envelope Cross Correlation Coefficients
Whitford Field, Summer; C-Band, Wide

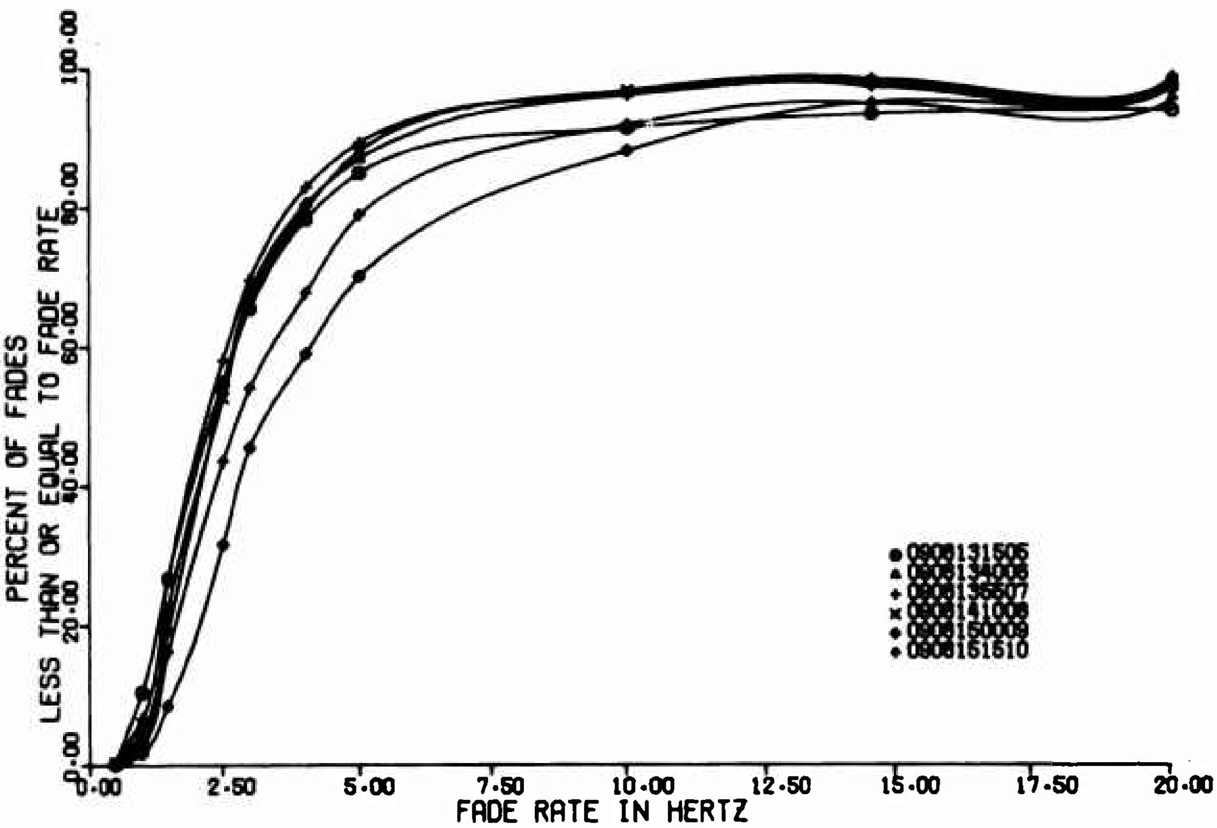


Figure 61. Fade Rate Distribution
Whitford Field, Summer; C-Band

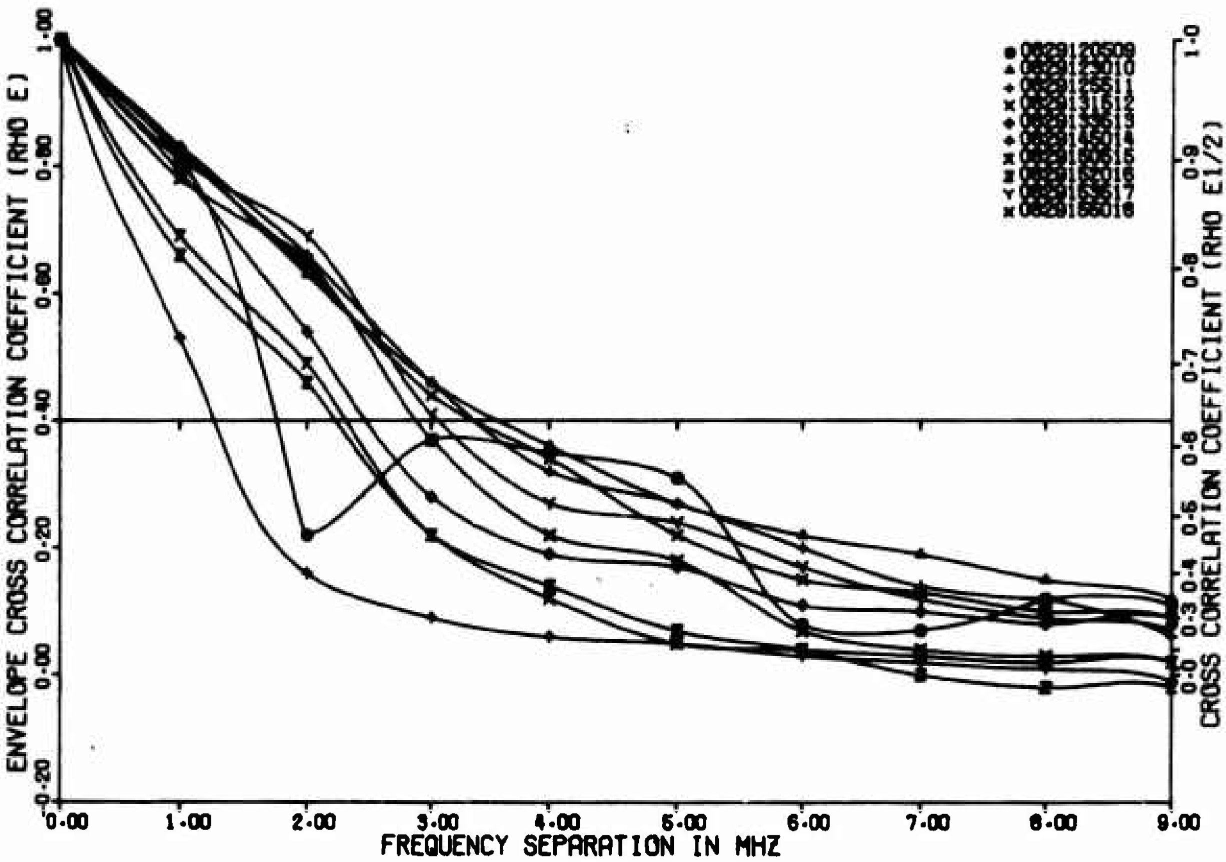


Figure 62. Envelope Cross Correlation Coefficients
Whitford Field, Summer; X-Band, Wide

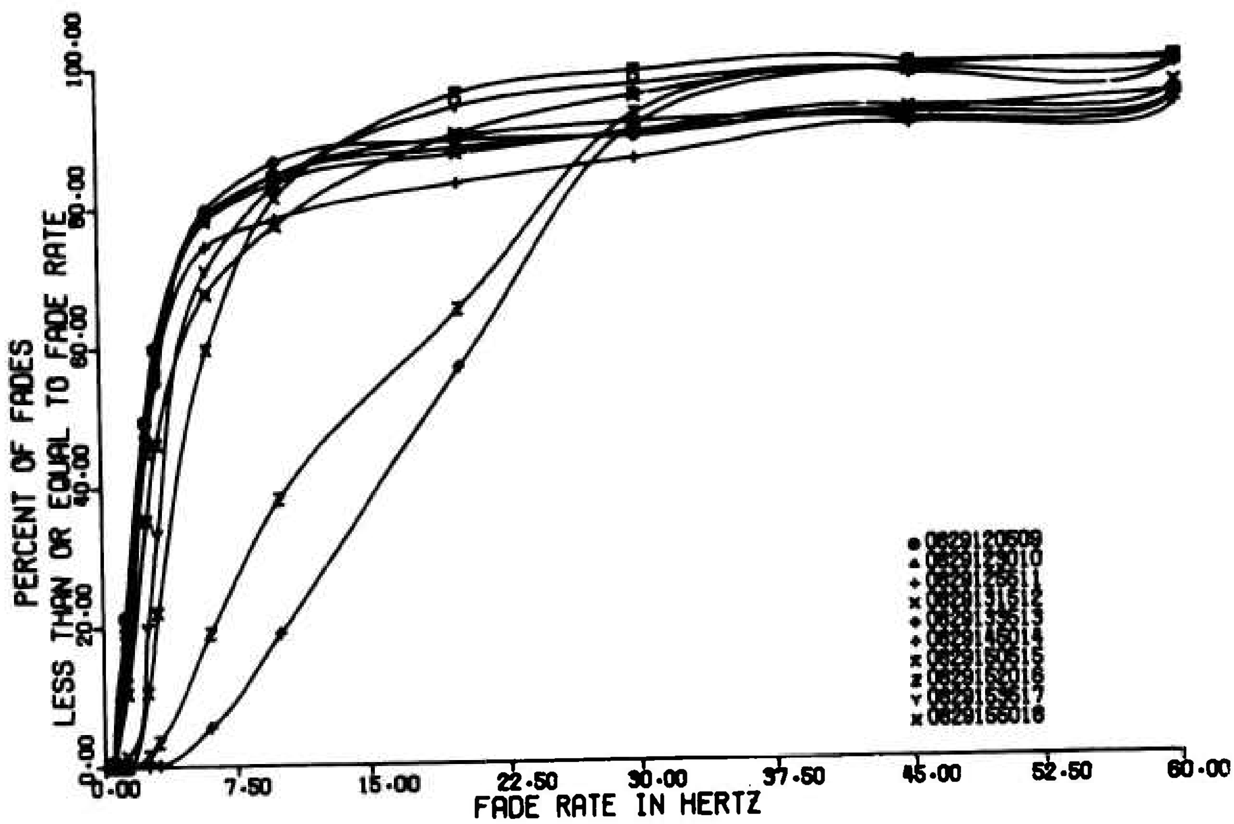


Figure 63. Fade Rate Distribution
Whitford Field, Summer; X-Band

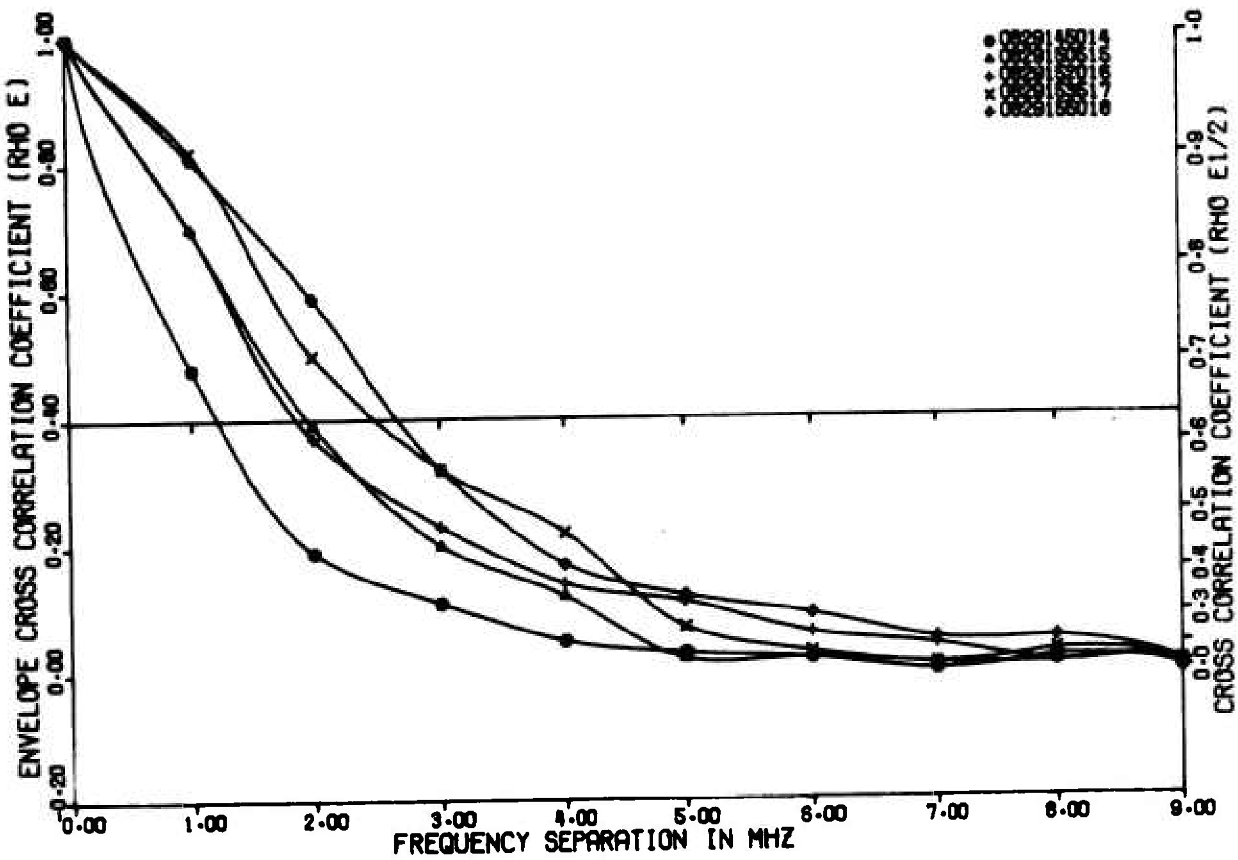


Figure 64. Envelope Cross Correlation Coefficients
Whitford Field, Summer; C-Band, Wide

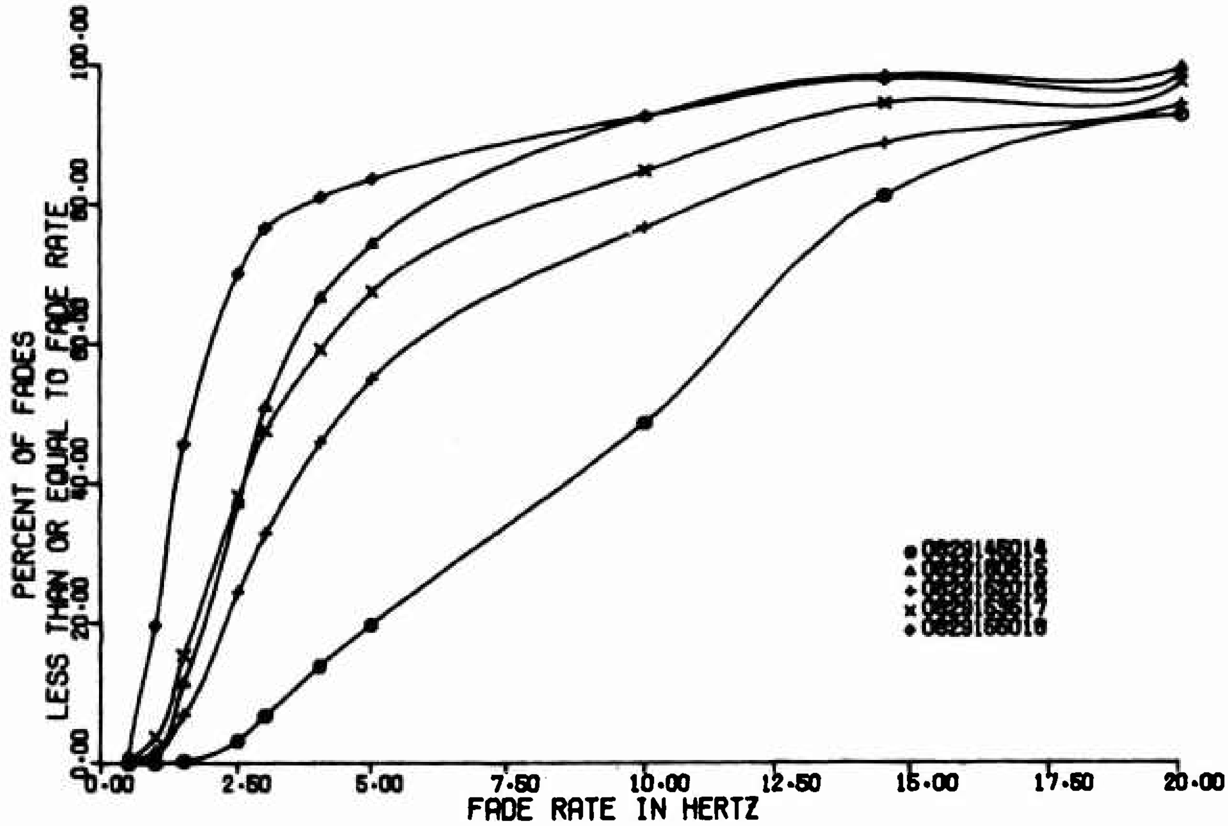


Figure 65. Fade Rate Distribution
Whitford Field, Summer; C-Band

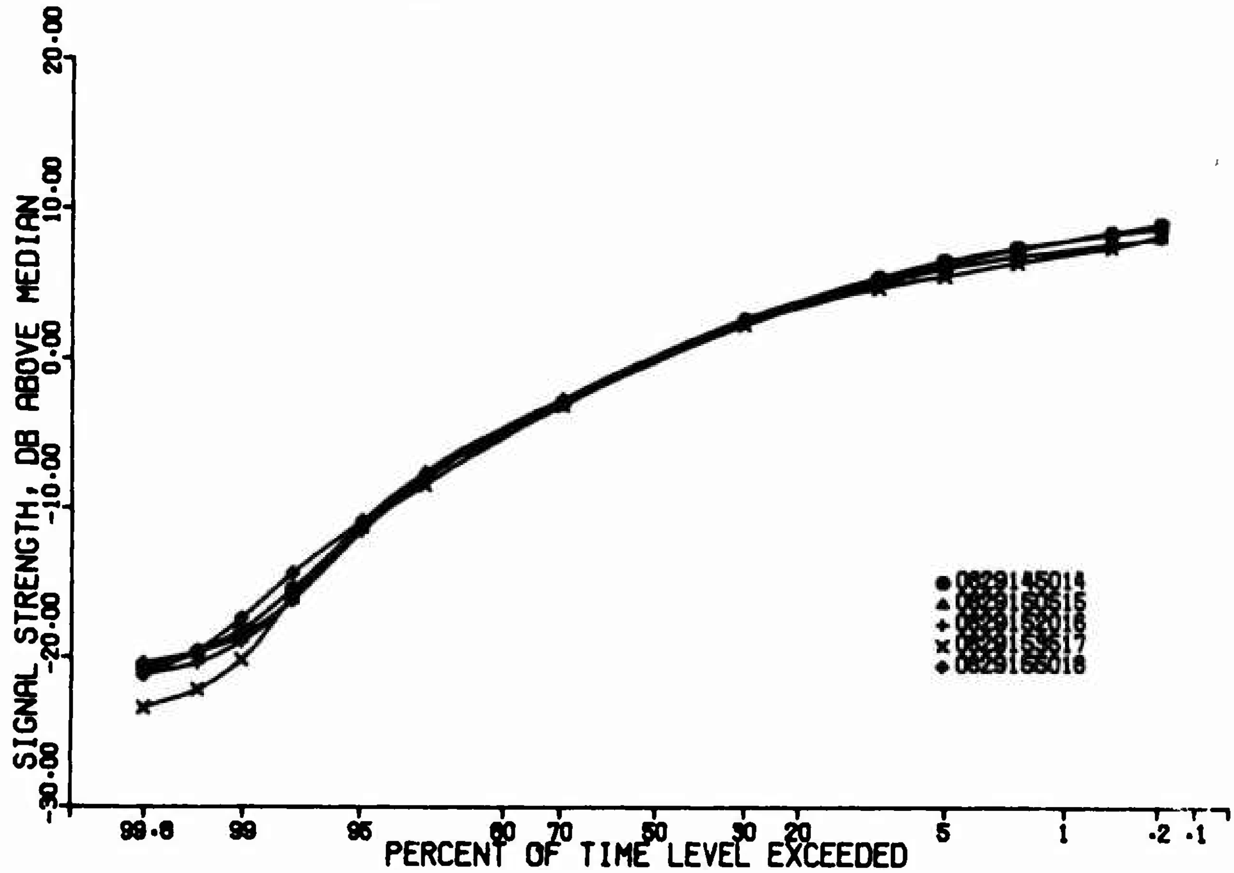


Figure 66. Signal Amplitude Level
Whitford Field, Summer; C-Band

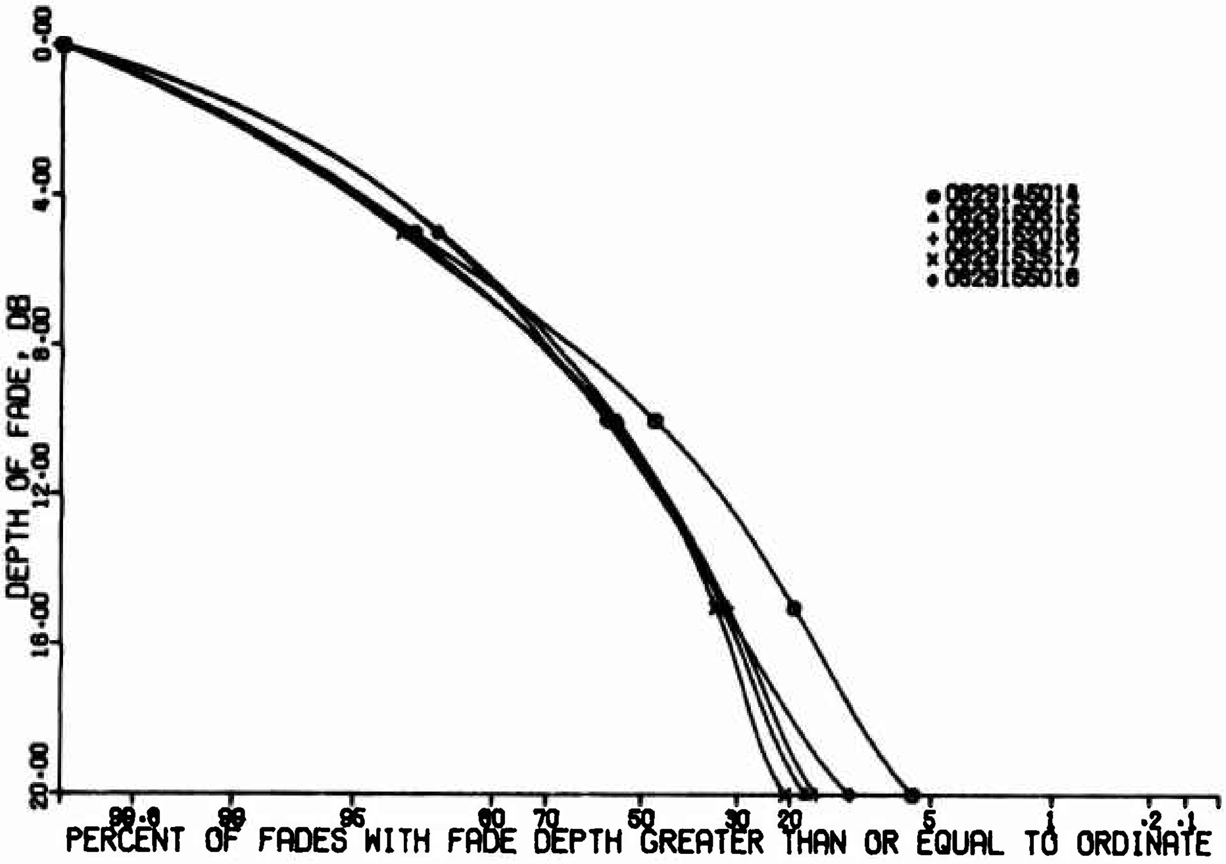


Figure 67. Distribution of Depth of Fades
Whitford Field, Summer; C-Band

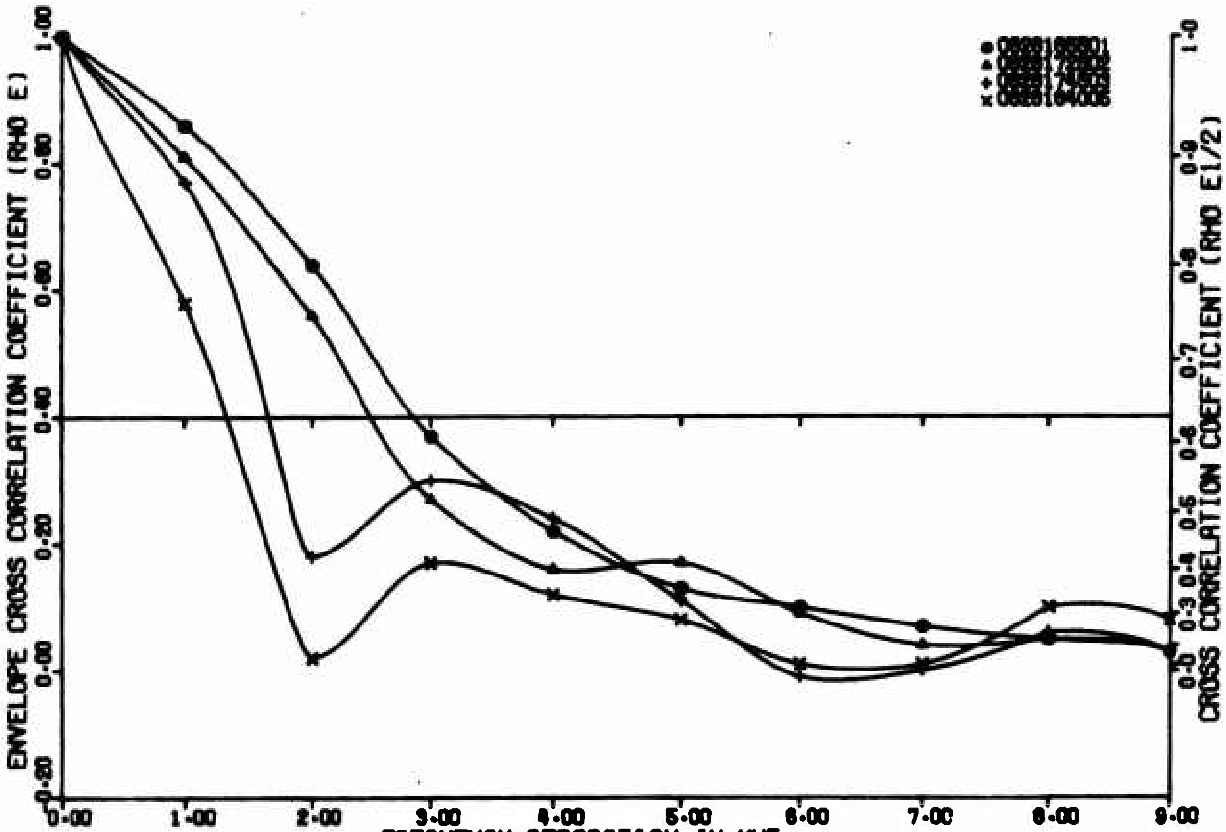


Figure 68. Envelope Cross Correlation Coefficients
Whitford Field, Summer; X-Band, Wide

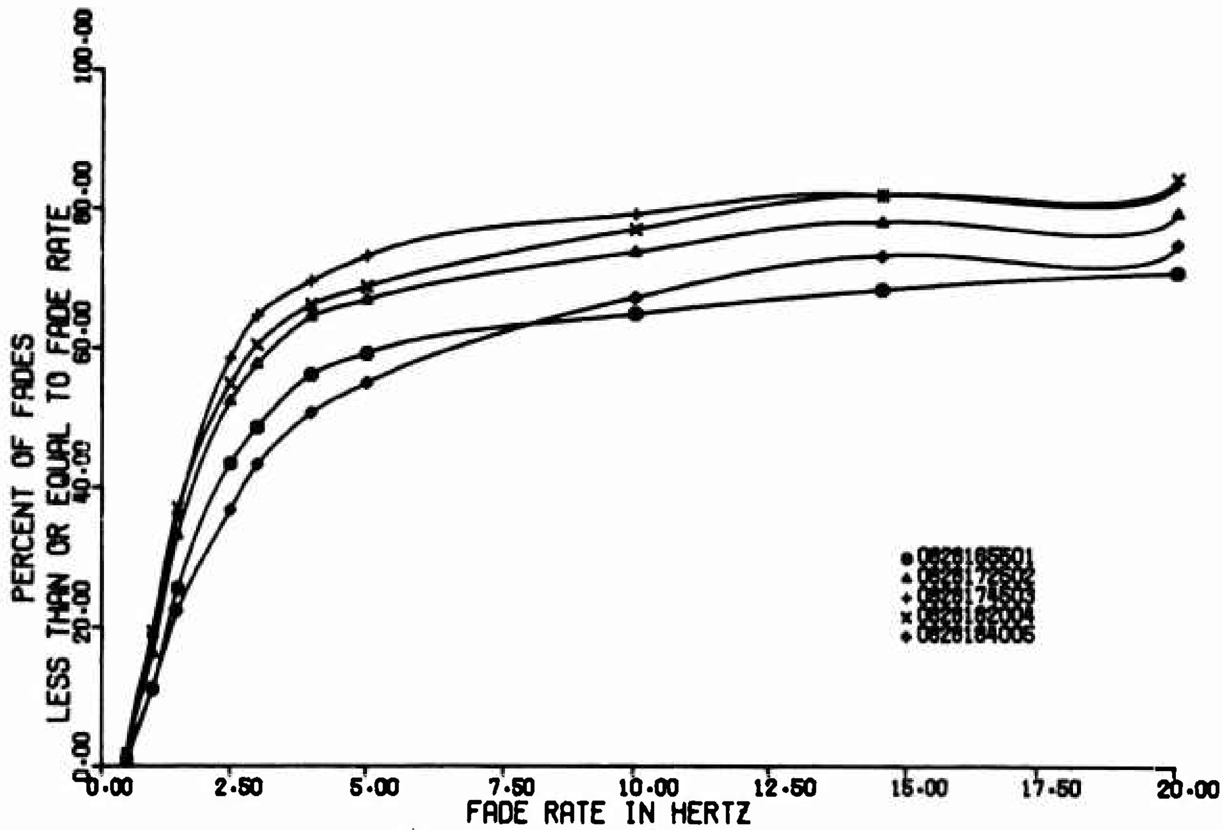


Figure 69. Fade Rate Distribution
Whitford Field, Summer; C-Band

3. Point Petre

The Point Petre path is 160 km from the transmitter at Model City. For the most part, the path is over Lake Ontario. The receiver site is located on the water's edge which might have an effect on the signal characteristics. The correlation bandwidths on this path varied fr. as little as 1 to 2 MHz to as high as 7 to 9 MHz at X-band with 3 to 5 MHz as the more typical value. At C-band the minimums were about 2 MHz, but the typical maxima were in the neighborhood of 5 to 8 MHz. The typical value was around 4 to 4 MHz. This path can be characterized as one with fade rates that jump quickly to a maximum and seldom does the distribution rise slowly with frequency. The other two sites had many unusual fade rate distributions. The narrow spacing data discussed in a previous section is also more definitely gaussian in shape. Signal strength on this path was never a problem.

It is interesting to compare the following sets of curves (all X- and C-band pairs) on a test by test basis. The data presented are not exactly simultaneous, for 5 minutes of C-band are reduced per test while only 2.5 minutes of the X-band are reduced. An exact time correspondence is not possible. Figures 70 through 74 represent the widest C-band; Figures 75 through 79, the widest X-band. Figures 80 through 84 represent the narrowest C-band followed by Figures 85 through 89 for the narrowest X-band. Figures 90 through 99 represent a typical case of repetitive data while Figures 100 through 109 are typical of changing conditions that result in a wide spread of data.

In seeking reasons for the departure of the propagation factors on this path from those of the other two paths, one might consider that in the first interim report it was said that the effect of terrain on troposcatter is most likely due to the effect that the terrain has on the weather. Here we have a smooth overwater path which is reasonably expected to have significantly different weather in the common volume from that obtained by the overland terrain. A further factor to consider is that the path is more northeast while the other two paths were east-west. This directional difference might cause the prevailing winds to interact with the scattering mechanism in a considerably different manner.

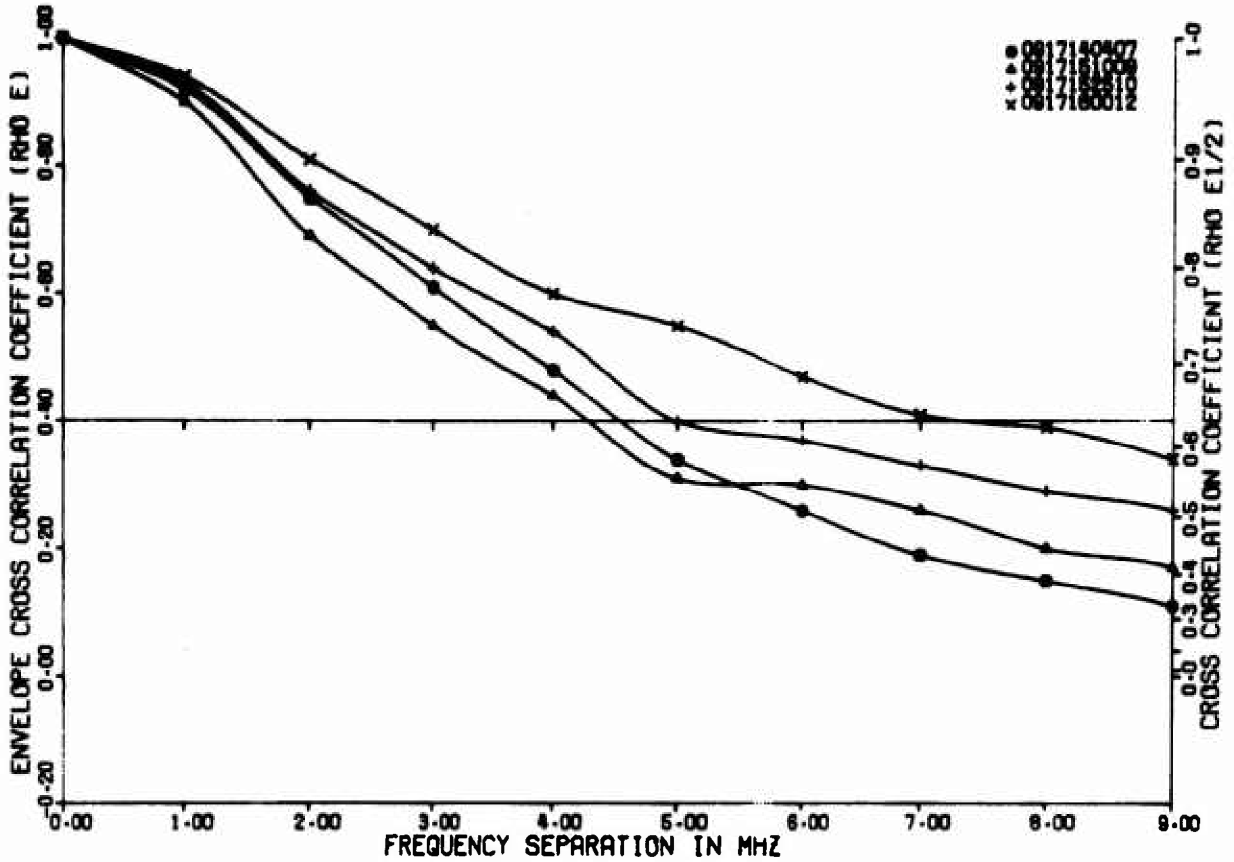


Figure 70. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Wide

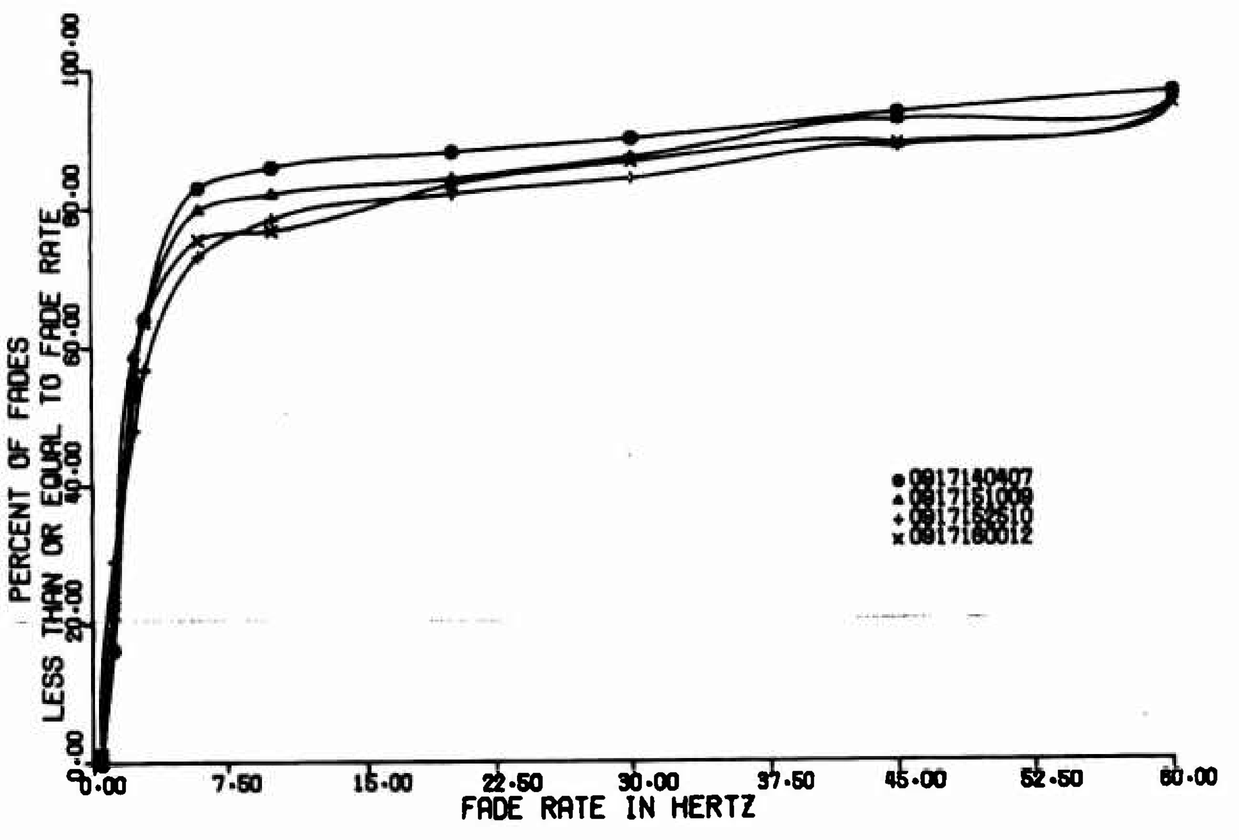


Figure 71. Fade Rate Distribution
Point Petre, September; C-Band

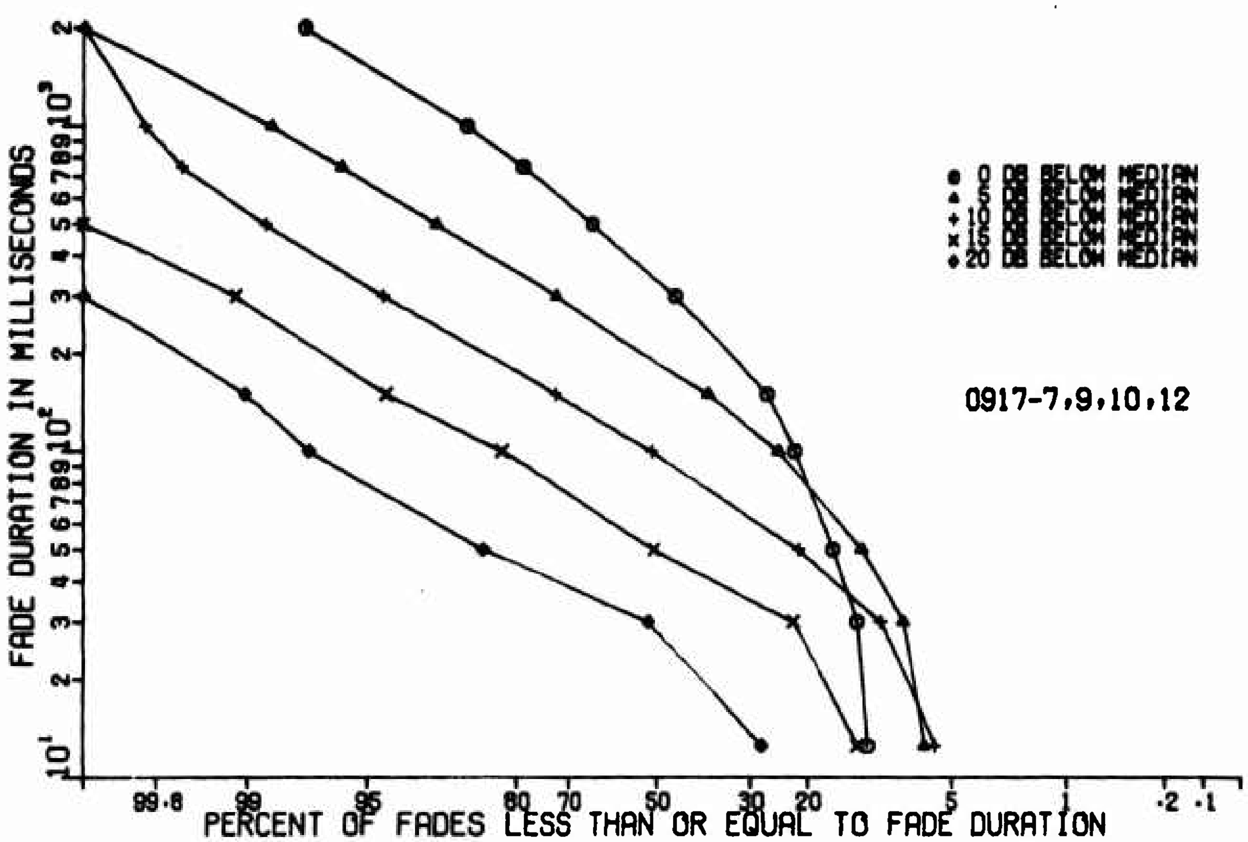


Figure 72. Distribution of Fade Duration
Point Petre, September; C-Band

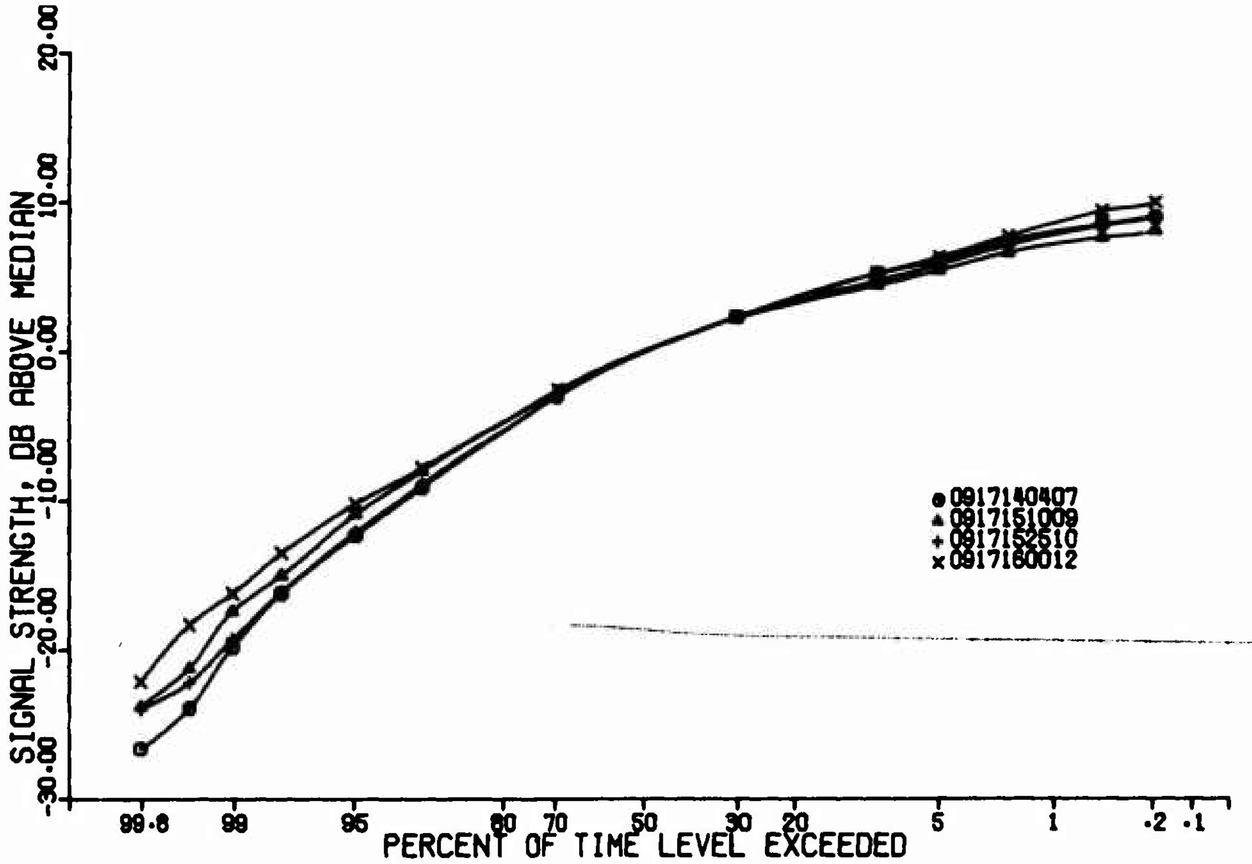


Figure 73. Signal Amplitude Level
Point Petre, September; C-Band

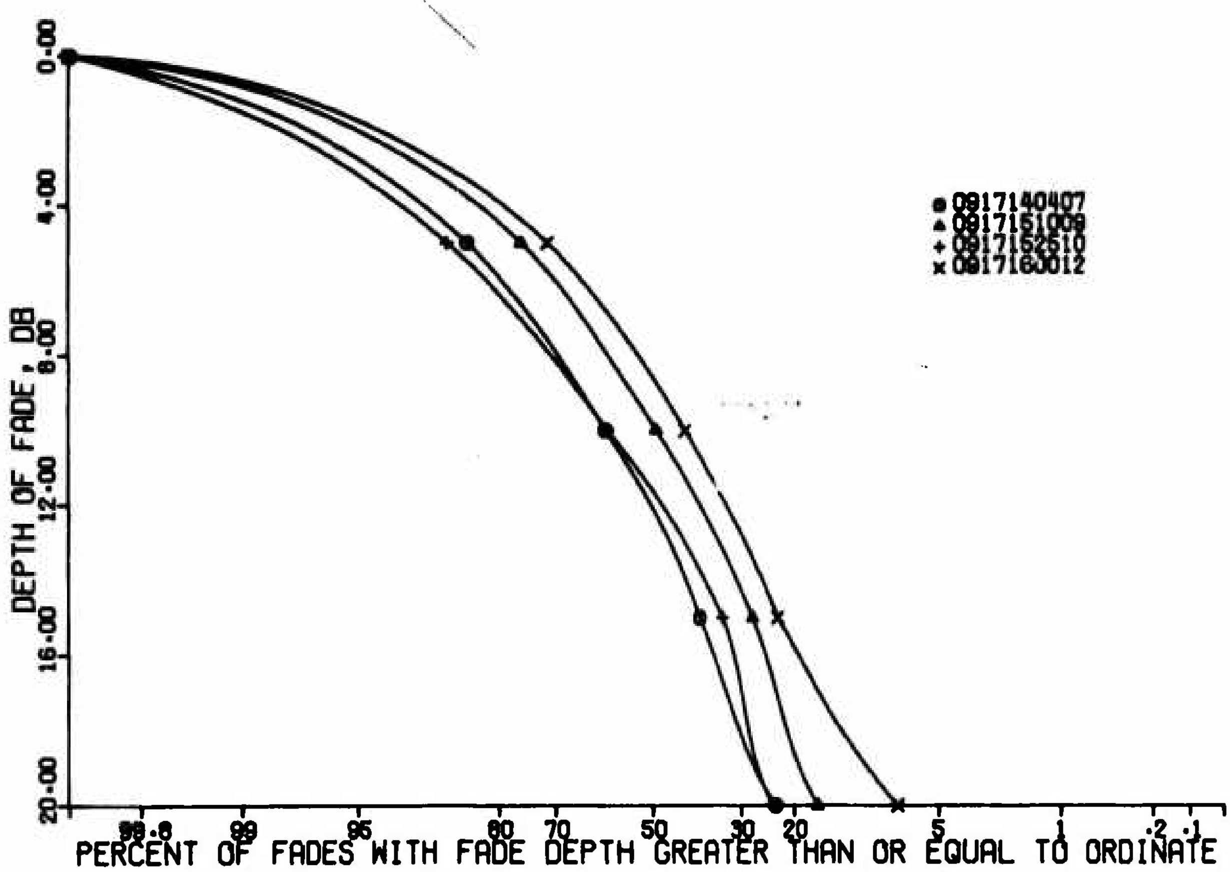


Figure 74. Distribution of Depth of Fades
Point Petre, September; C-Band

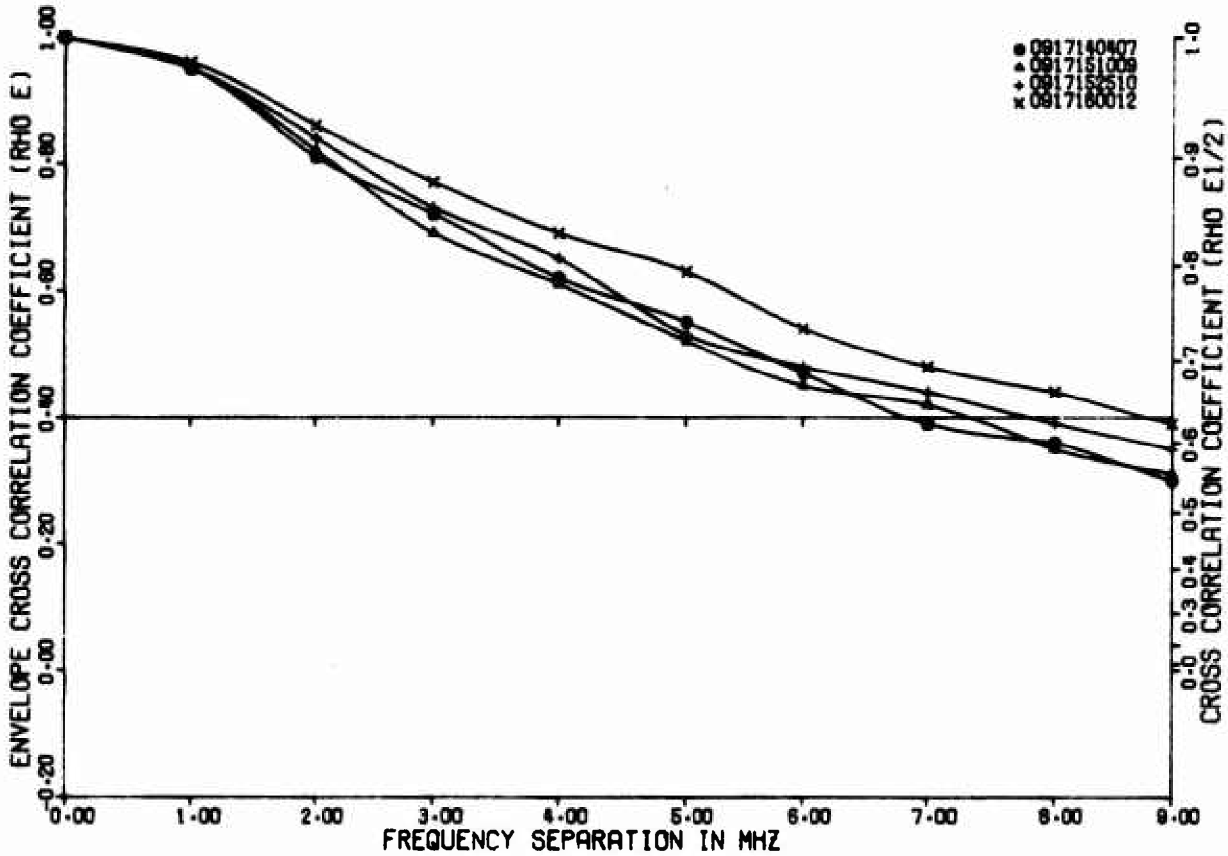


Figure 75. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Wide

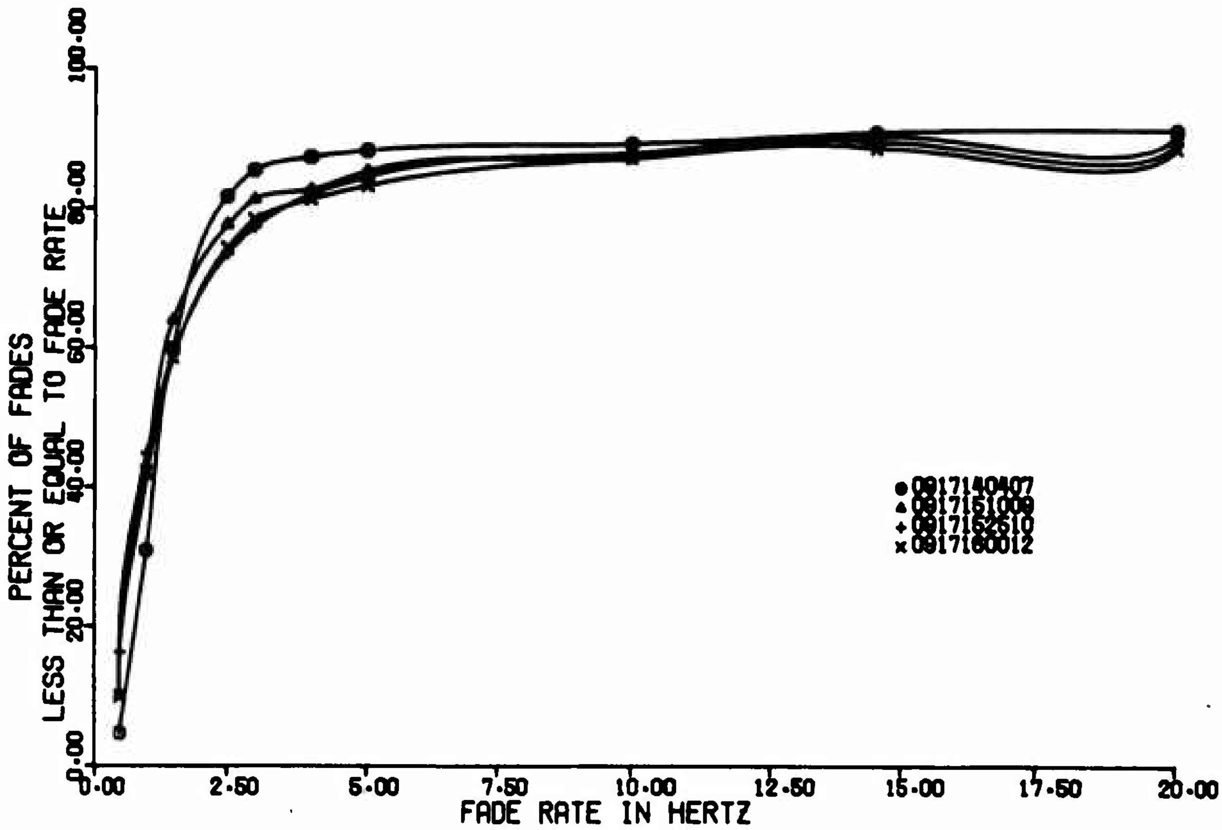


Figure 76. Fade Rate Distribution
Point Petre, September; X-Band

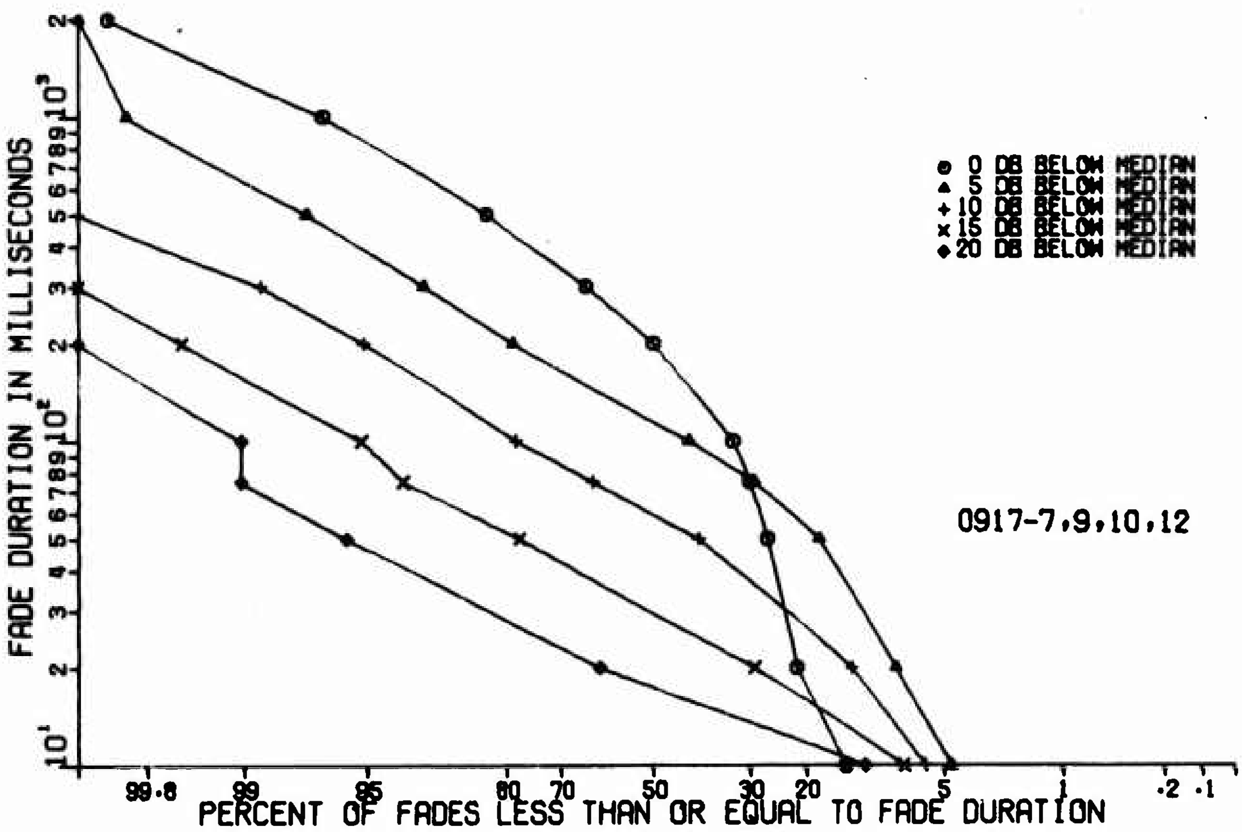


Figure 77. Distribution of Fade Duration
Point Petre, September; X-Band

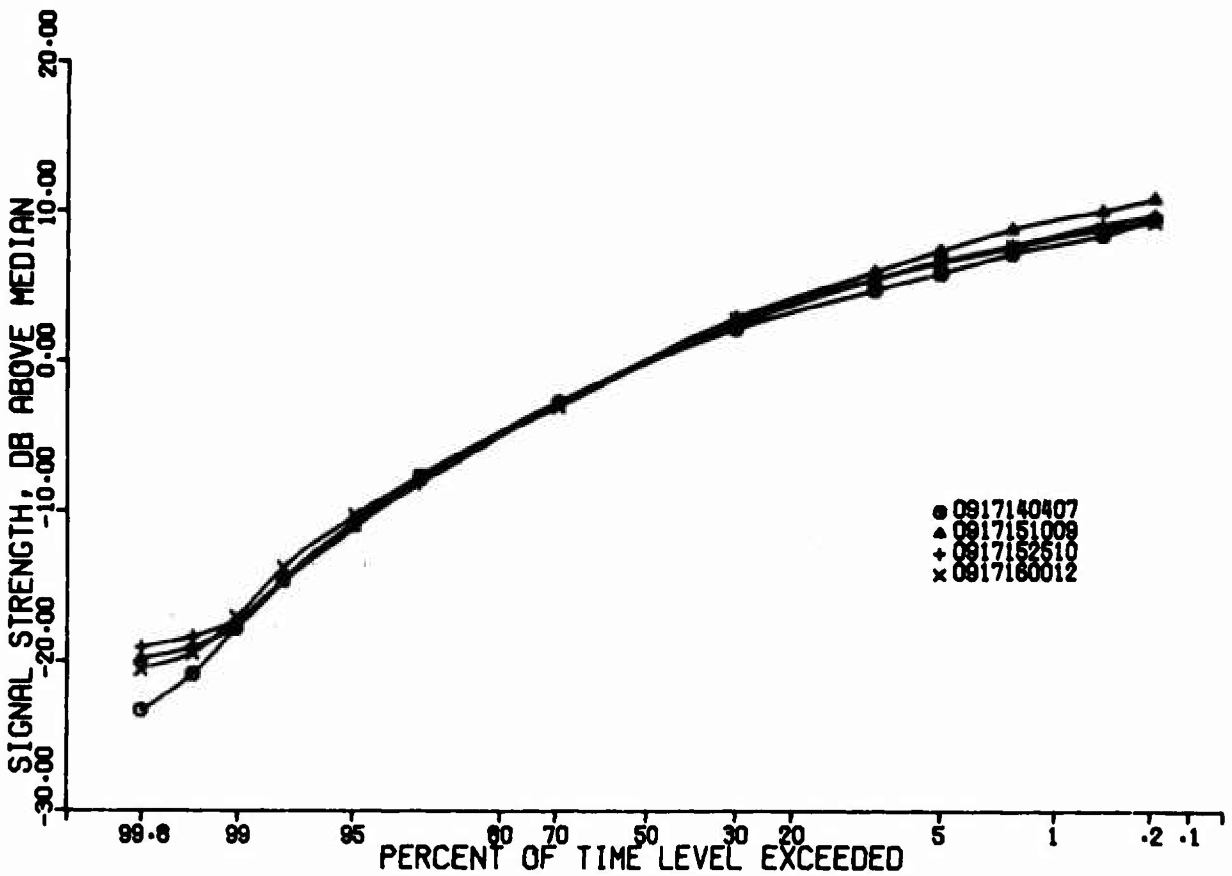


Figure 78. Signal Amplitude Level
Point Petre, September; X-Band

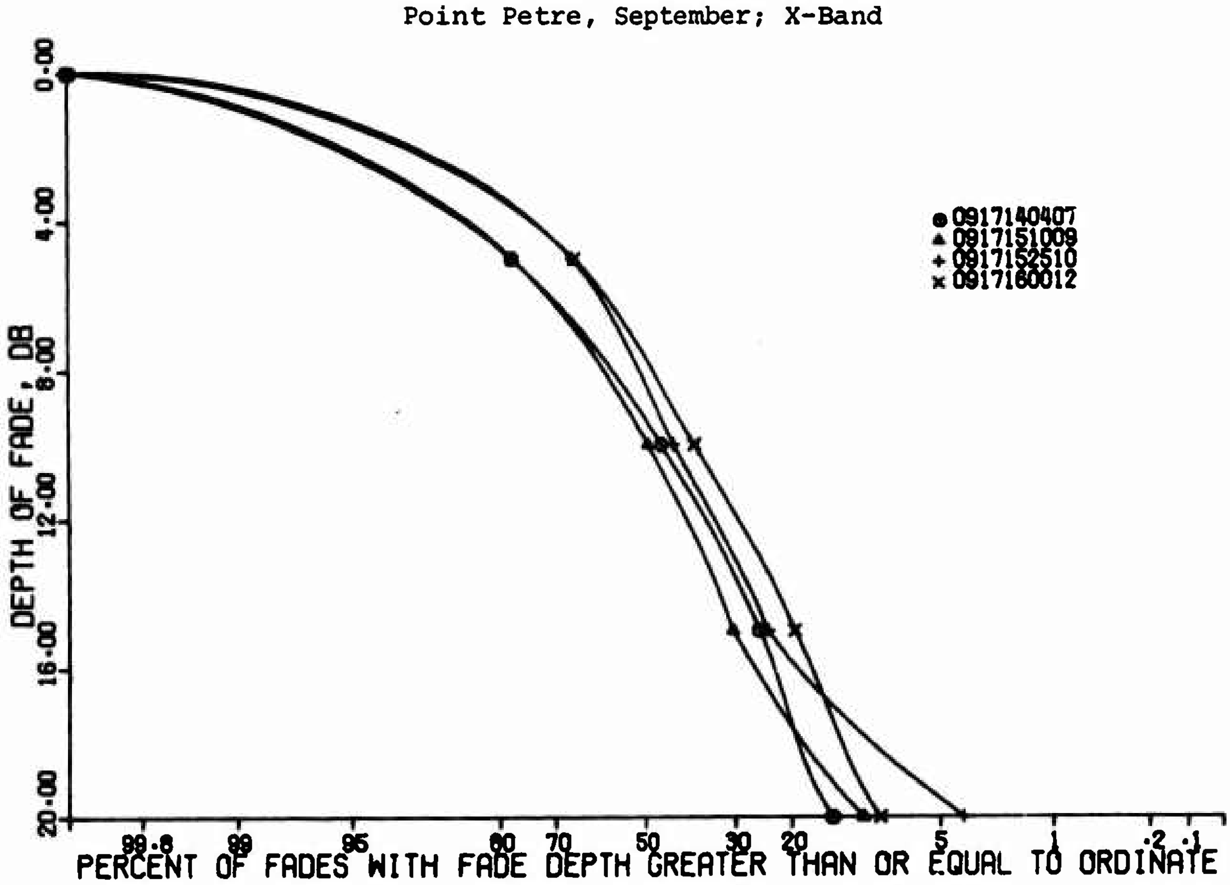


Figure 79. Distribution of Depth of Fades
Point Petre, September; X-Band

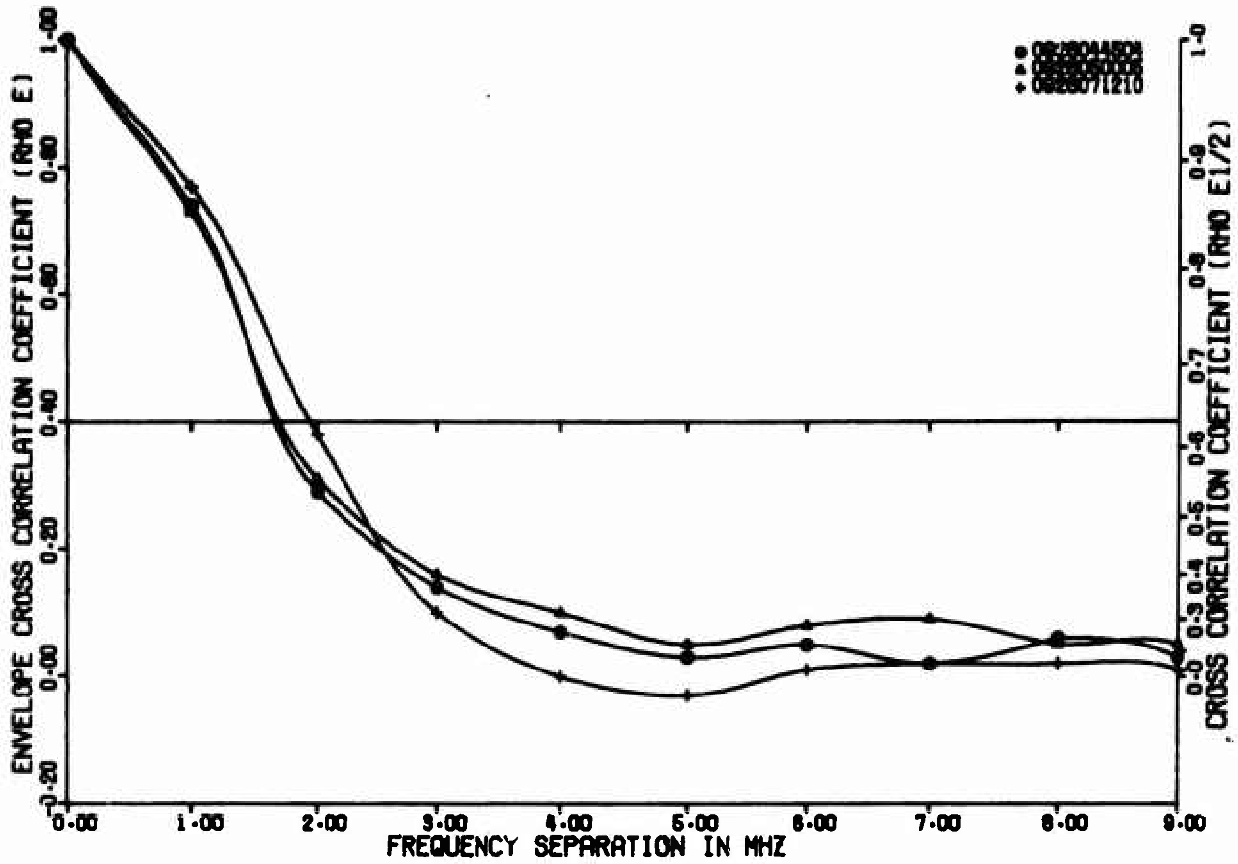


Figure 80. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Wide

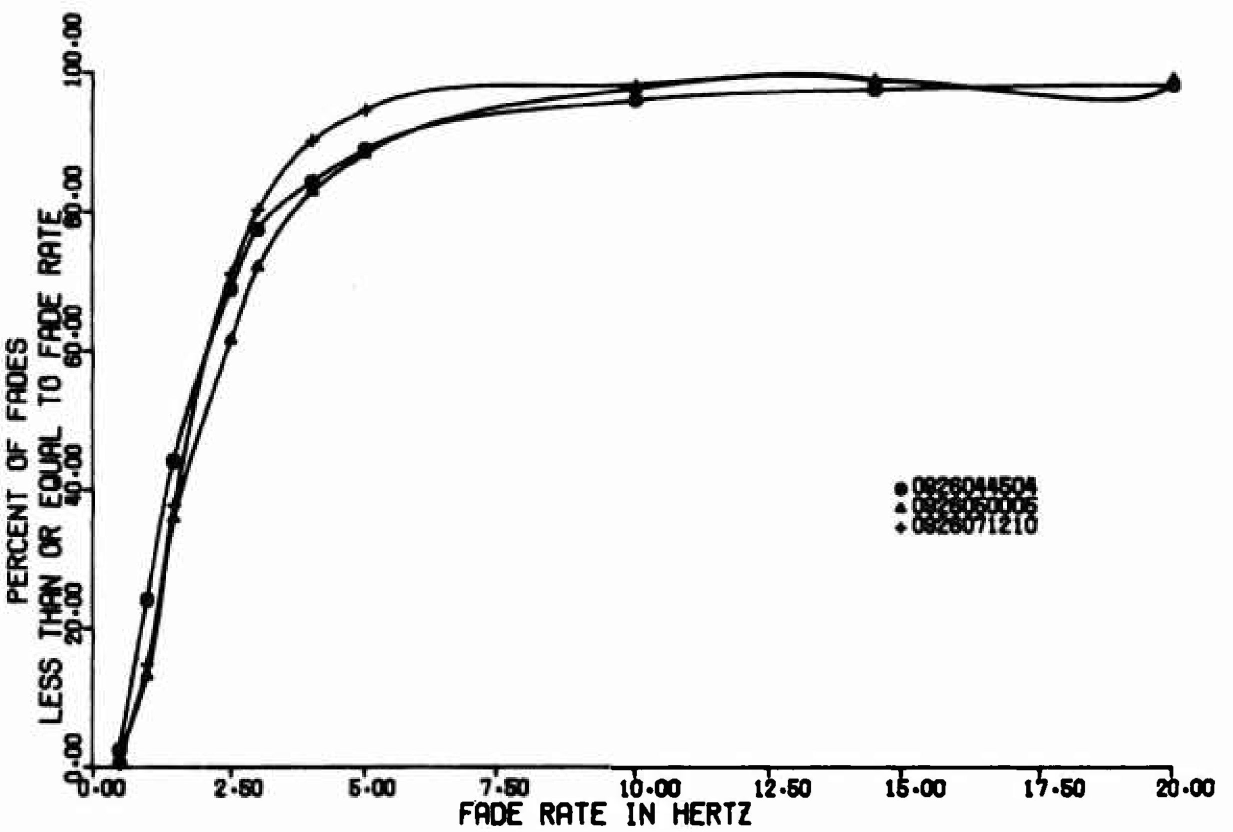


Figure 81. Fade Rate Distribution
Point Petre, September; C-Band

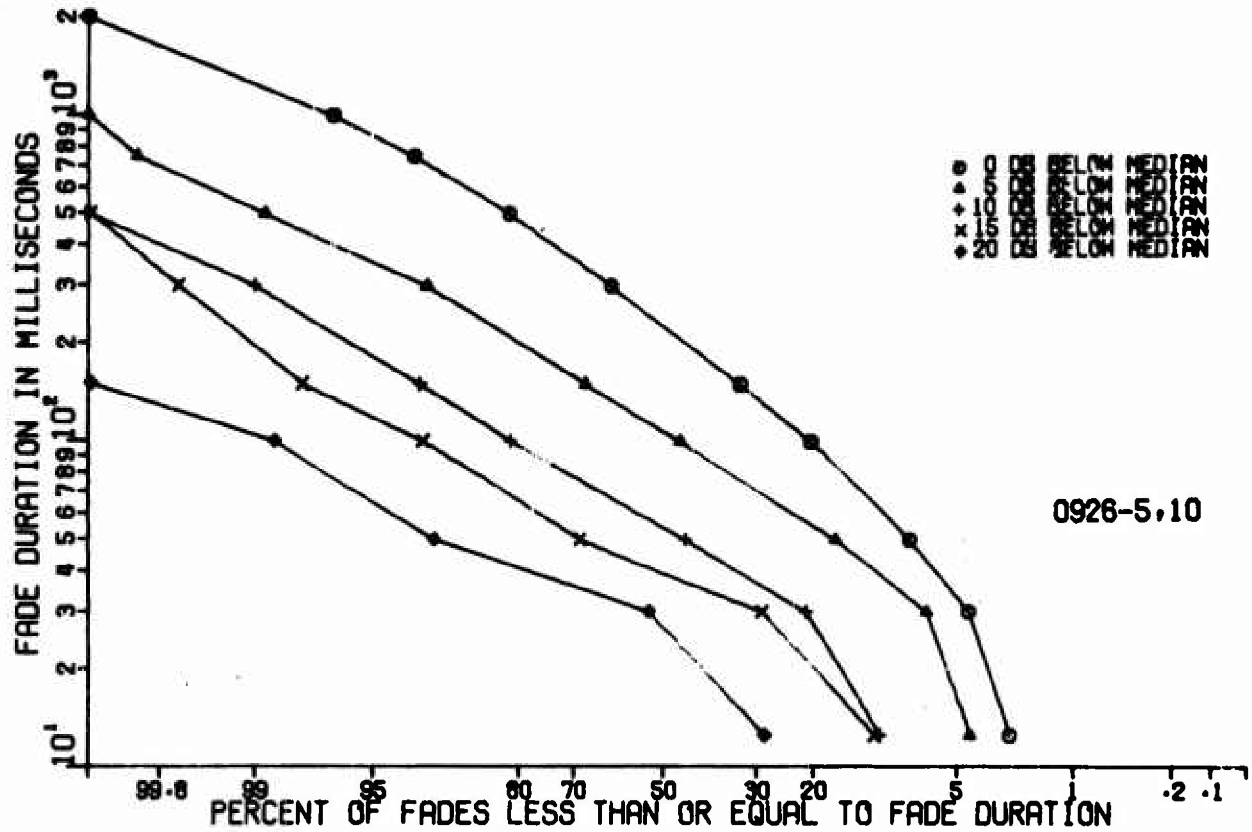


Figure 82. Distribution of Fade Duration
Point Petre, September; C-Band

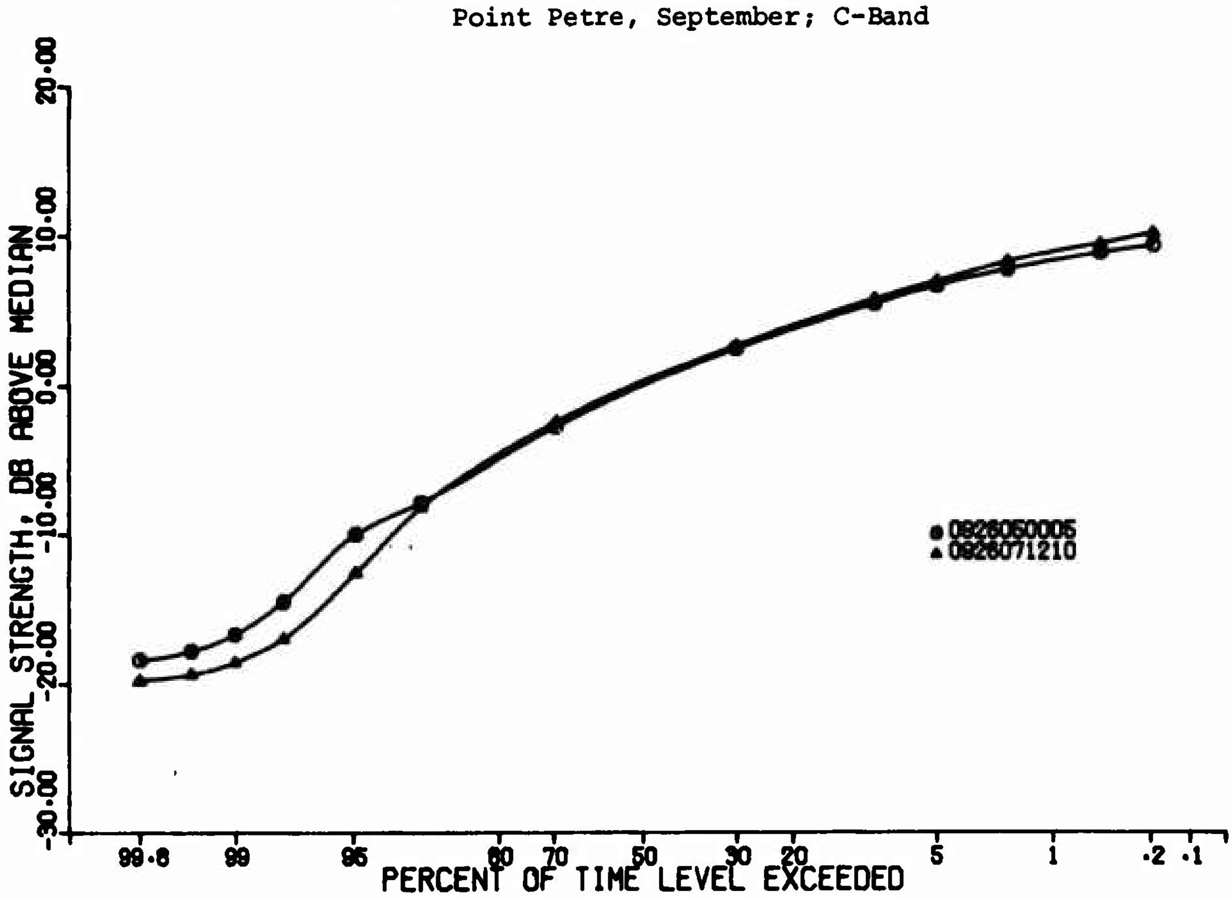


Figure 83. Signal Amplitude Level
Point Petre, September; C-Band

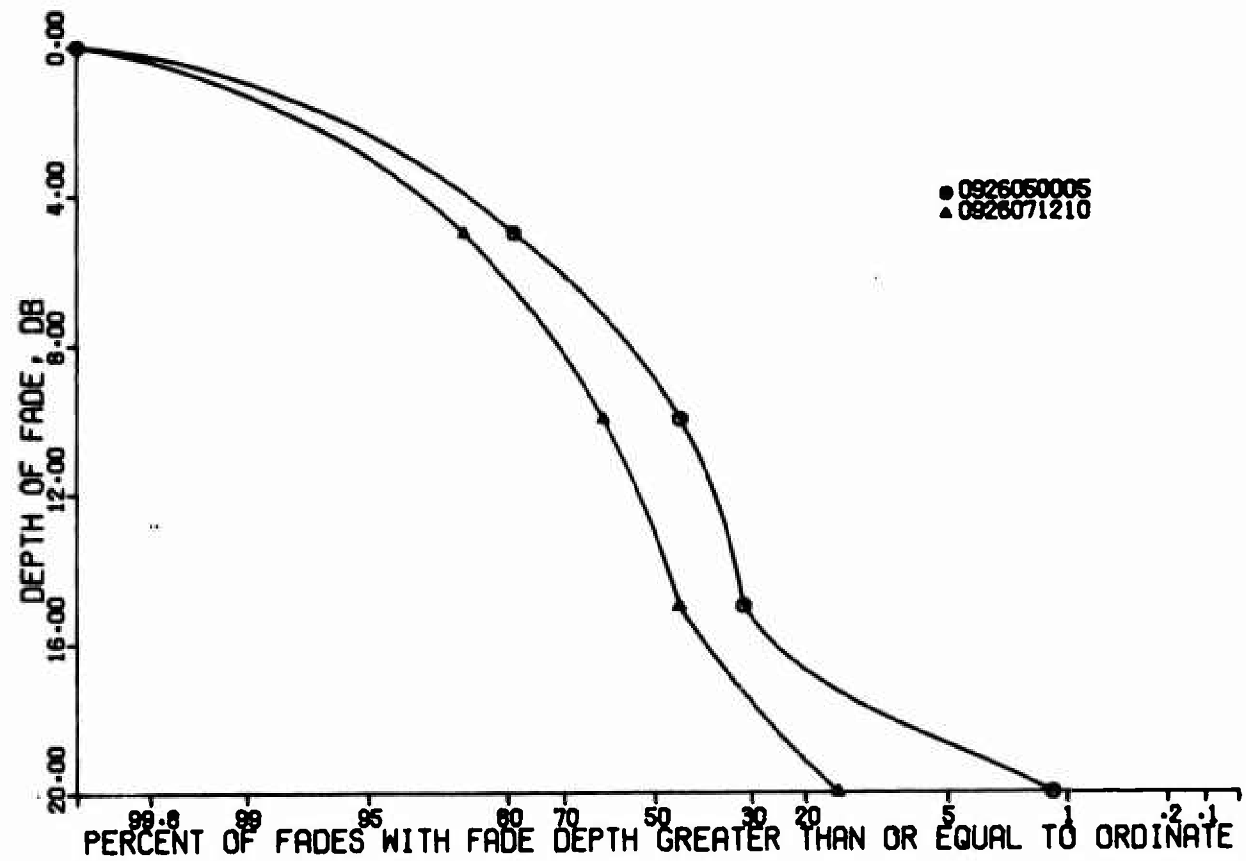


Figure 84. Distribution of Depth of Fades
Point Petre, September; C-Band

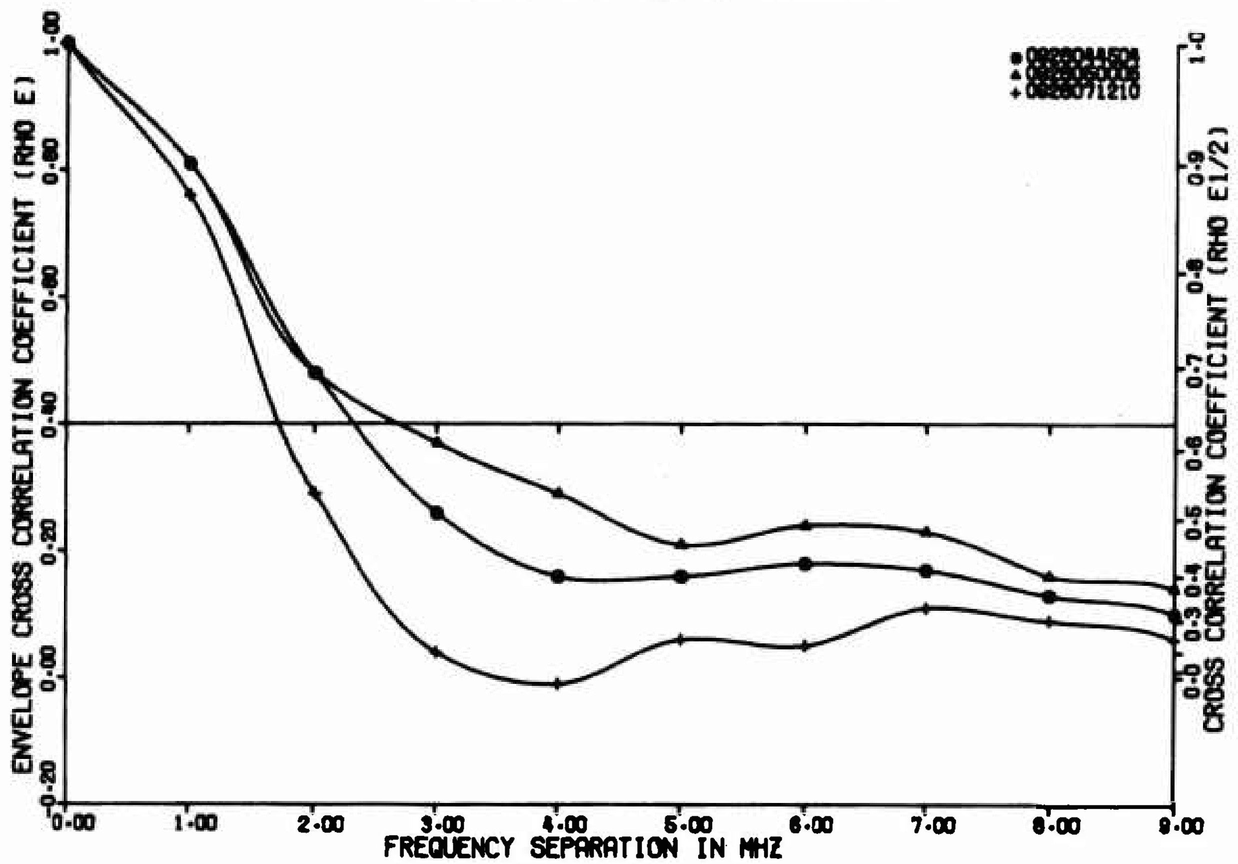


Figure 85. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Wide

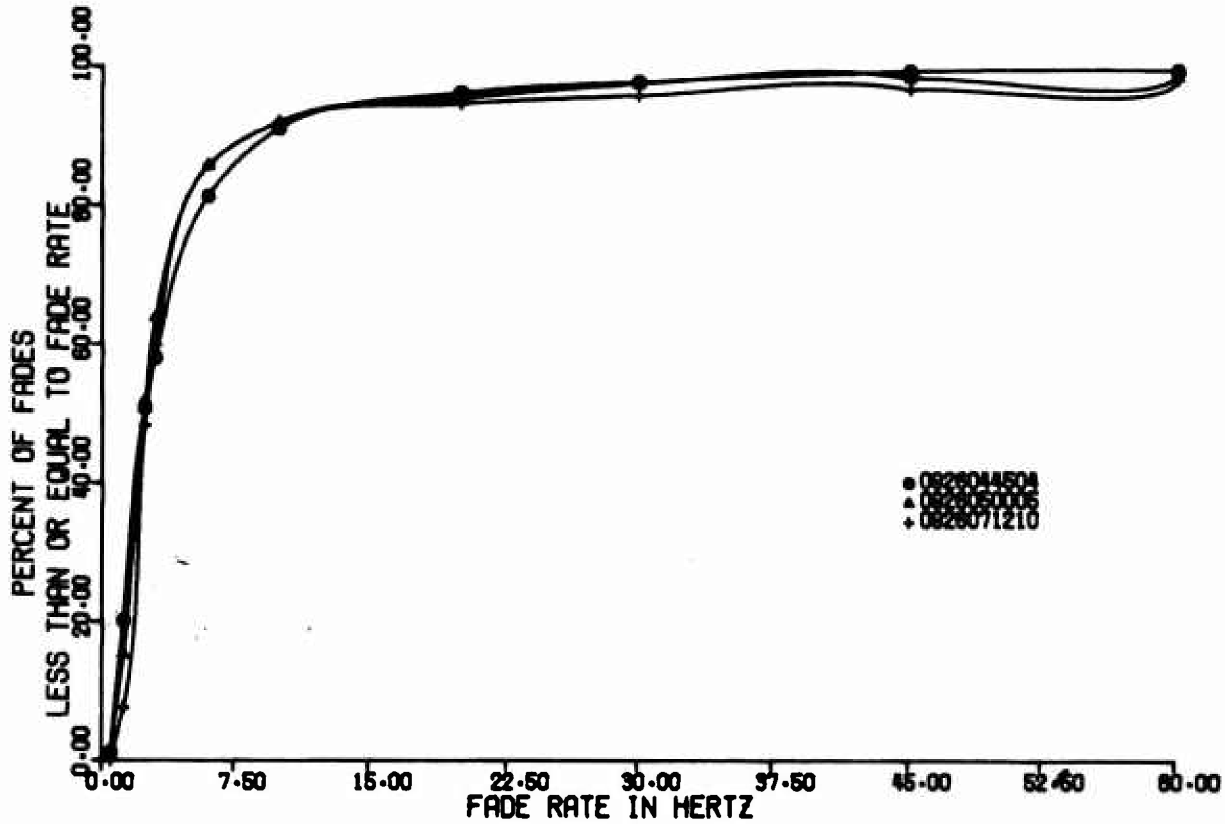


Figure 86. Fade Rate Distribution
Point Petre, September; X-Band

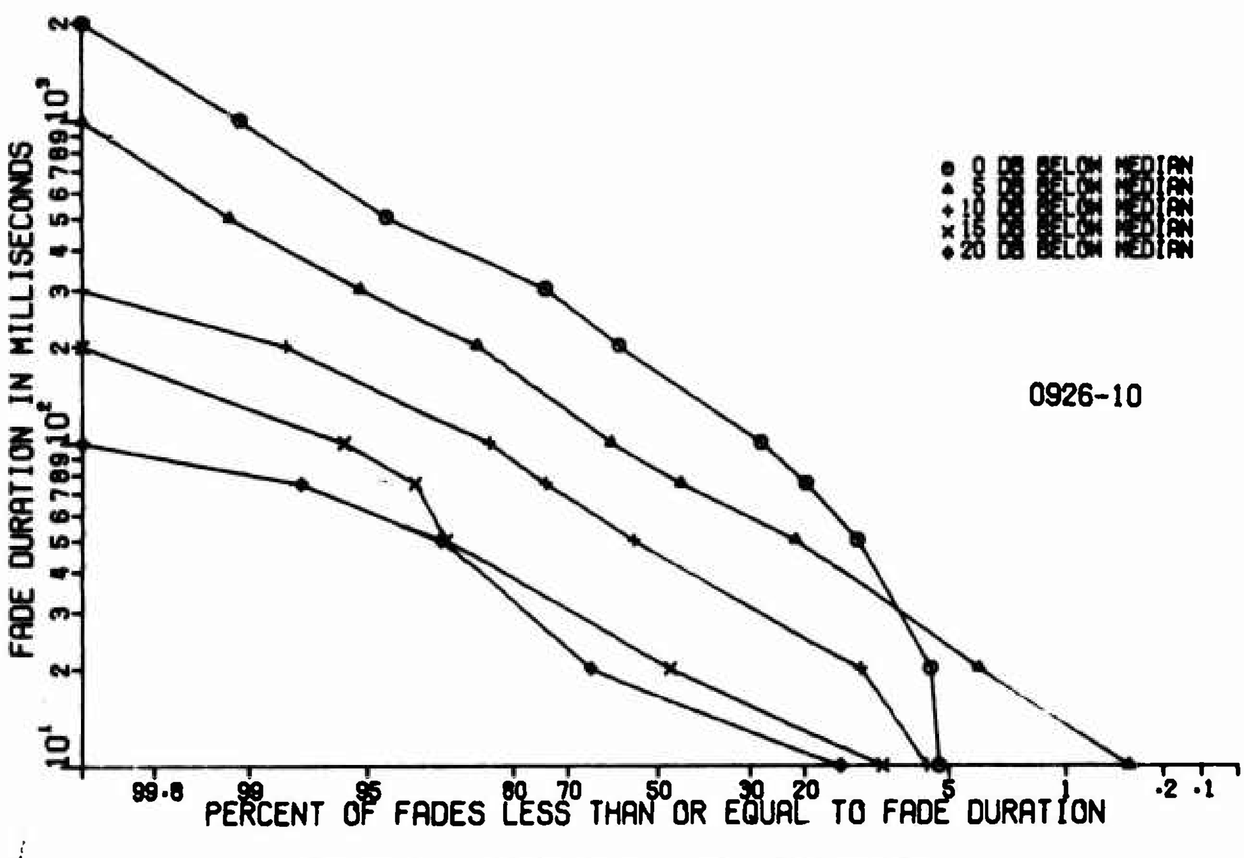


Figure 87. Distribution of Fade Duration
Point Petre, September; X-Band

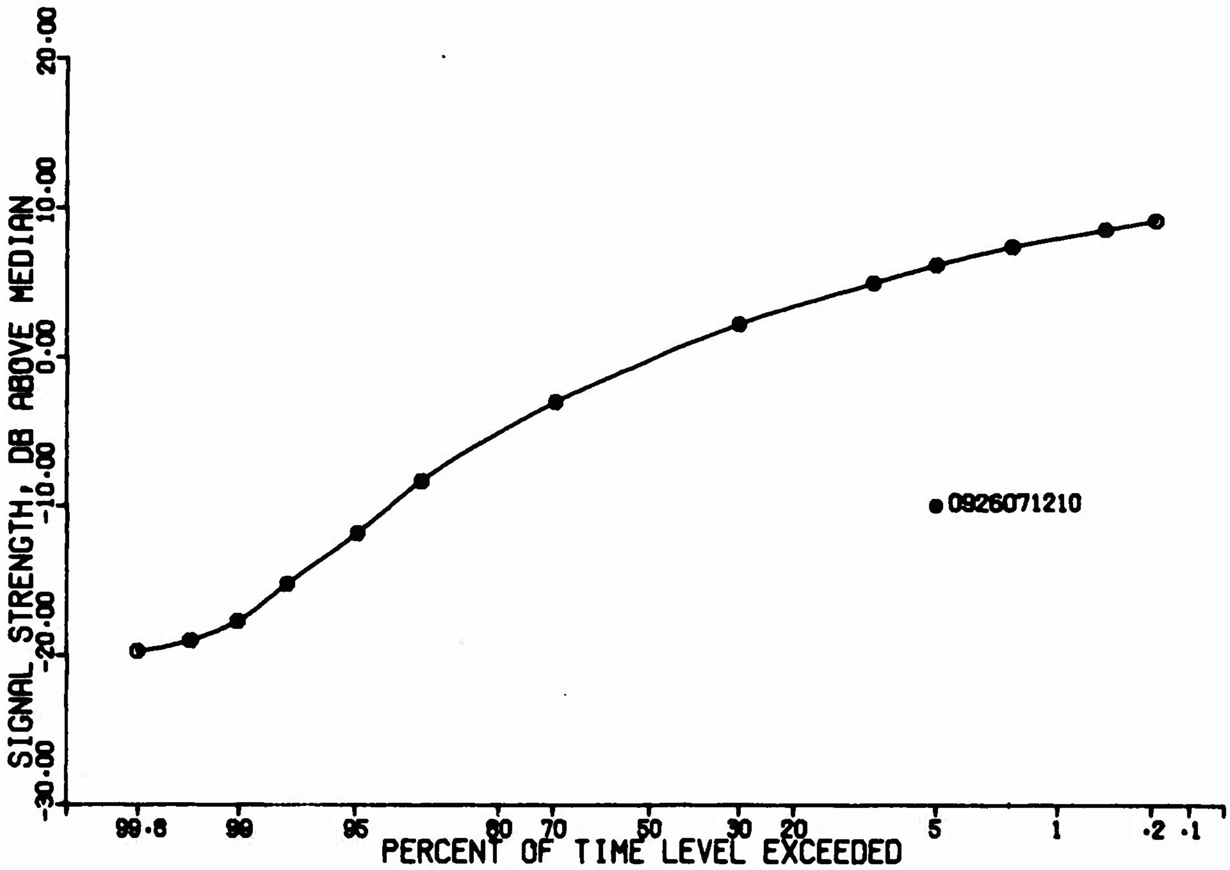


Figure 88. Signal Amplitude Level
Point Petre, September; X-Band

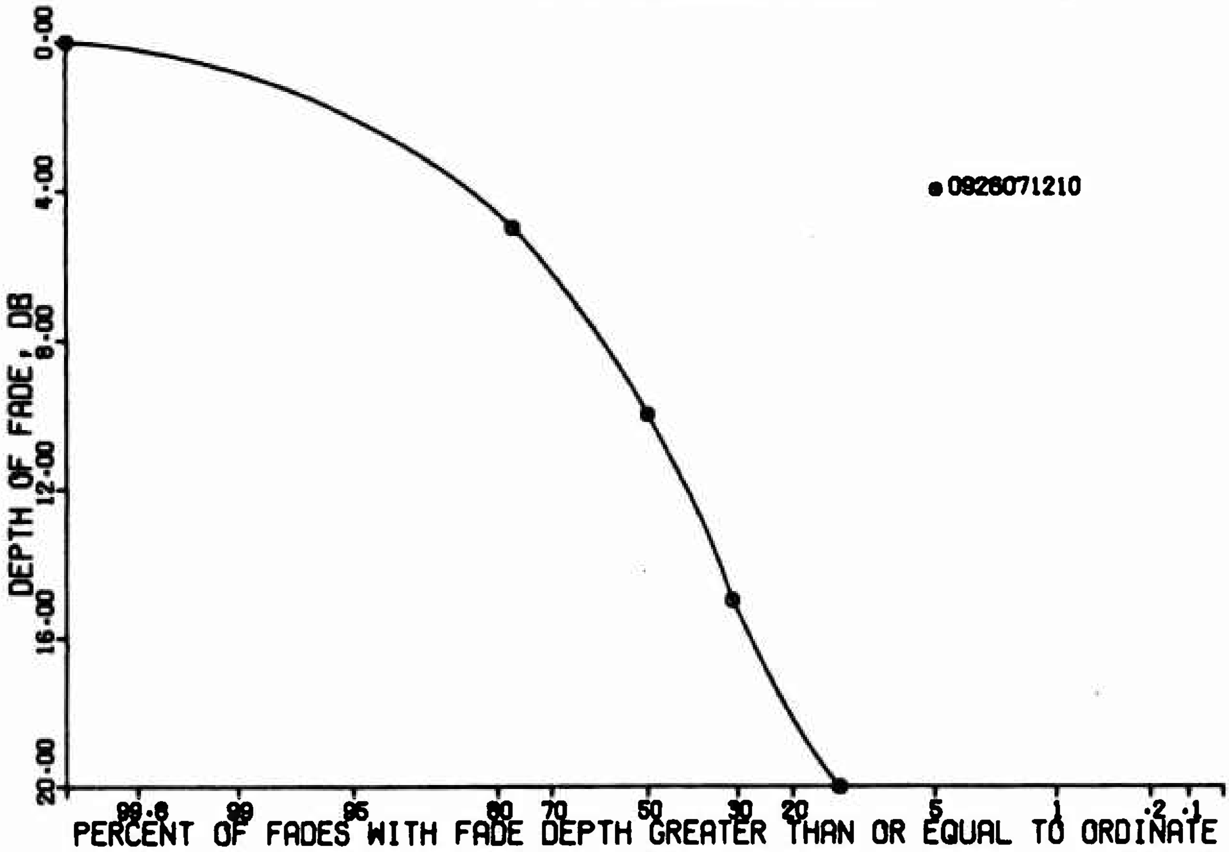


Figure 89. Distribution of Depth of Fades
Point Petre, September; X-Band

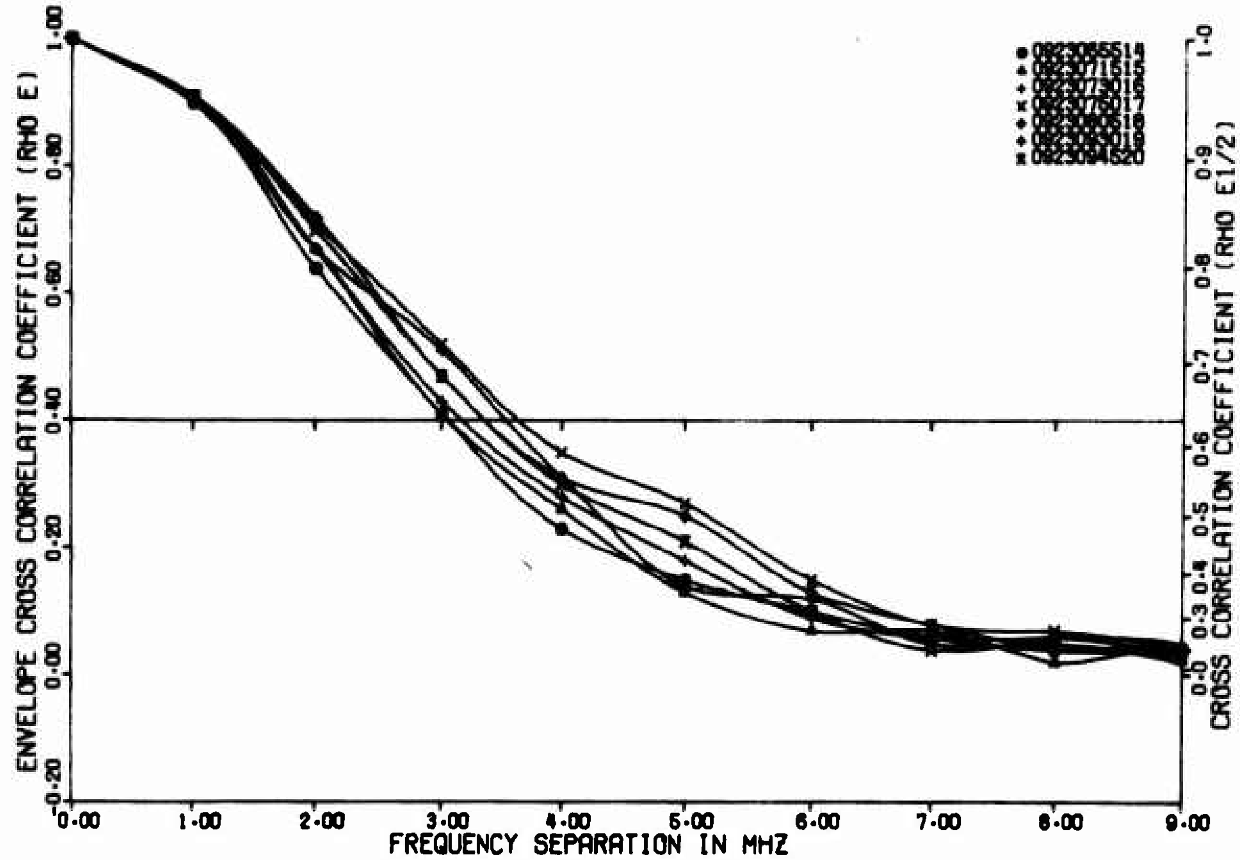


Figure 90. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Wide

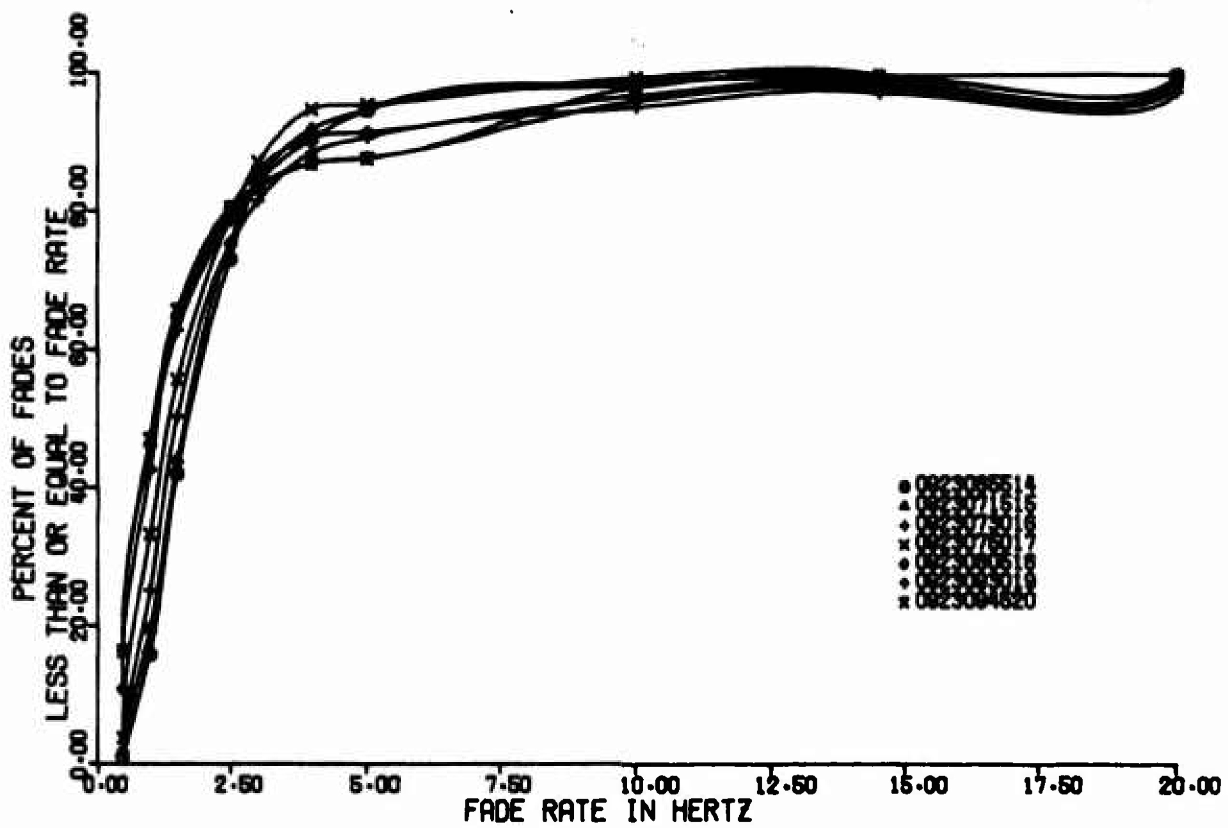


Figure 91. Fade Rate Distribution
Point Petre, September; C-Band

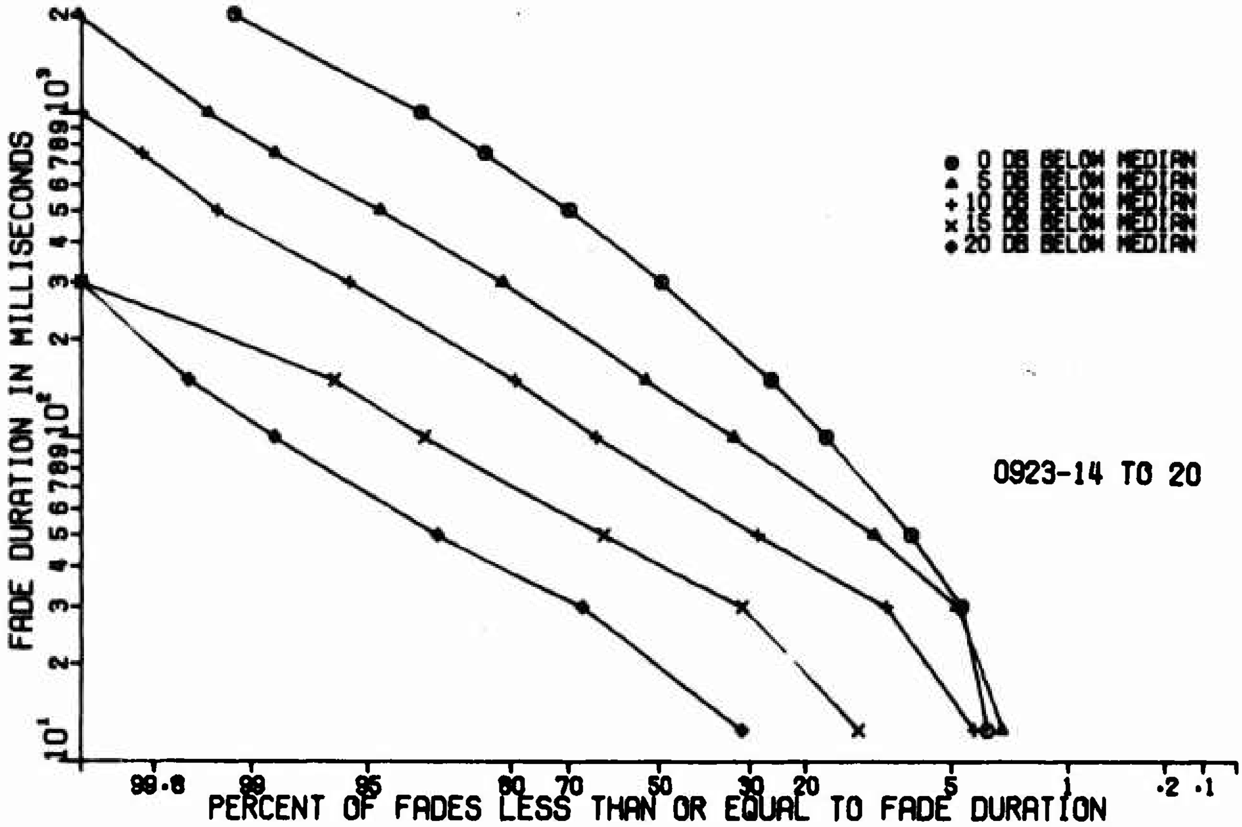


Figure 92. Distribution of Fade Duration
Point Petre, September; C-Band

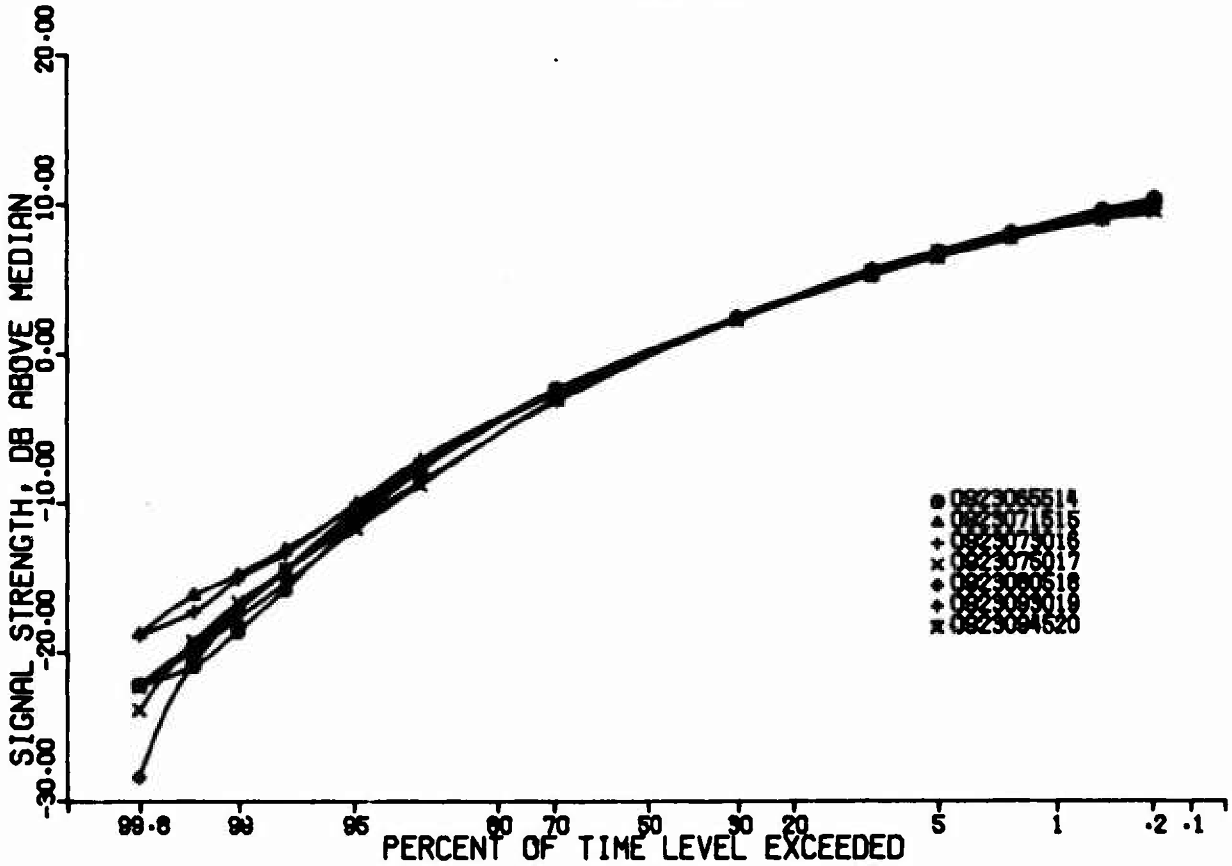


Figure 93. Signal Amplitude Level
Point Petre, September; C-Band

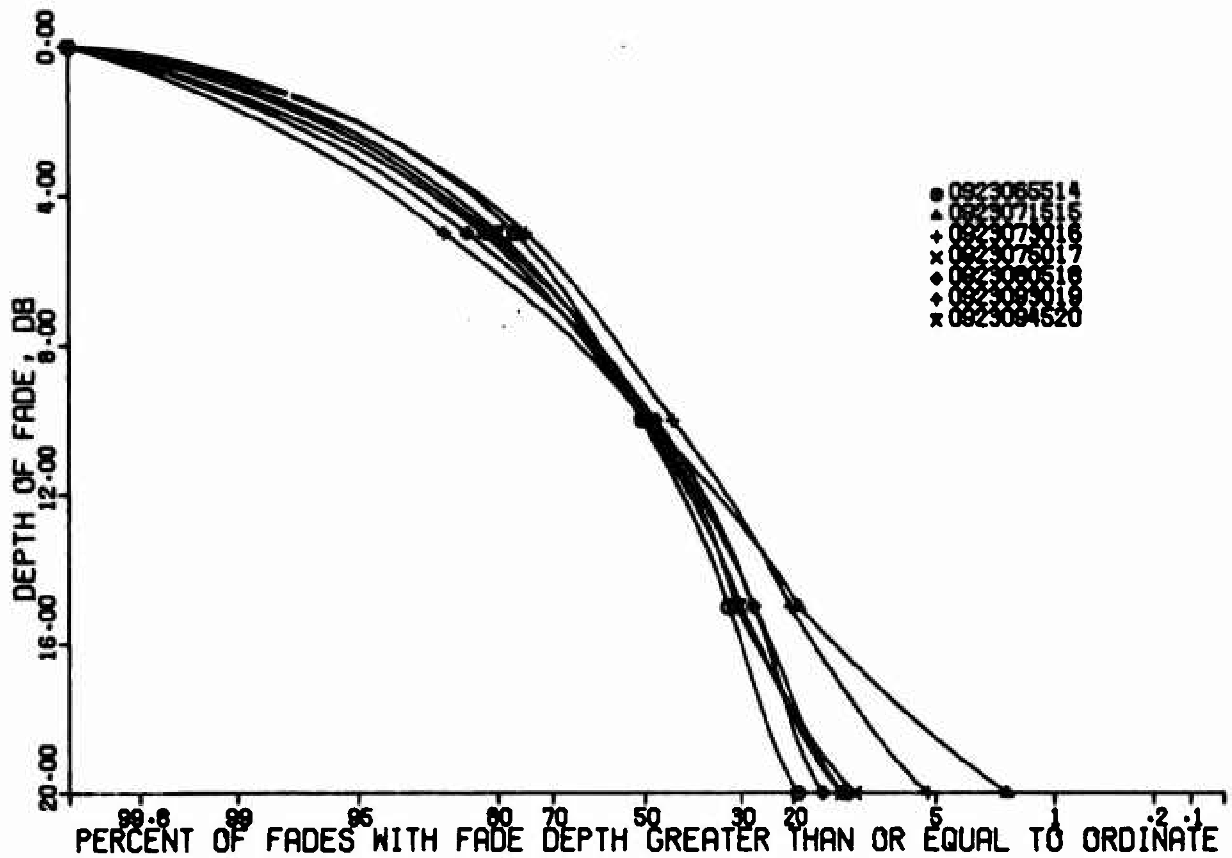


Figure 94. Distribution of Depth of Fades
Point Petre, September; C-Band

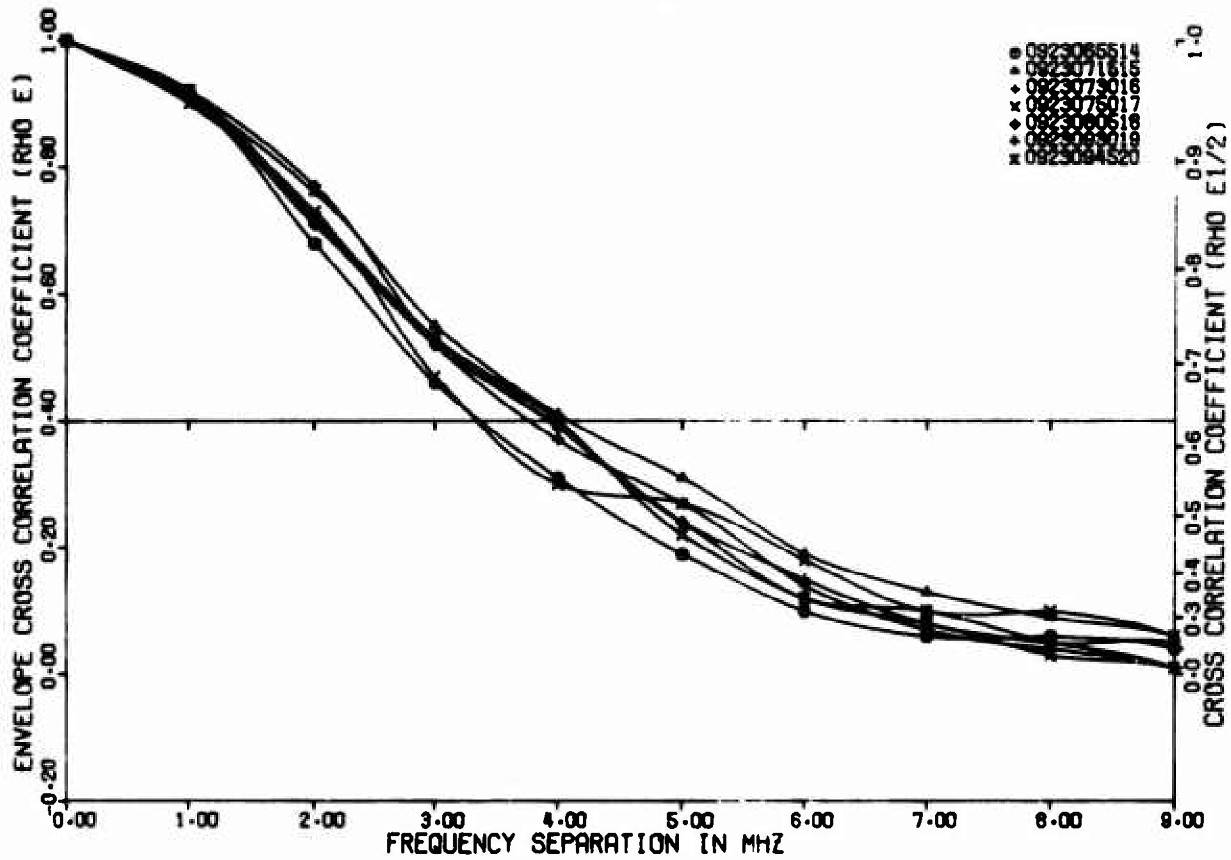


Figure 95. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Wide

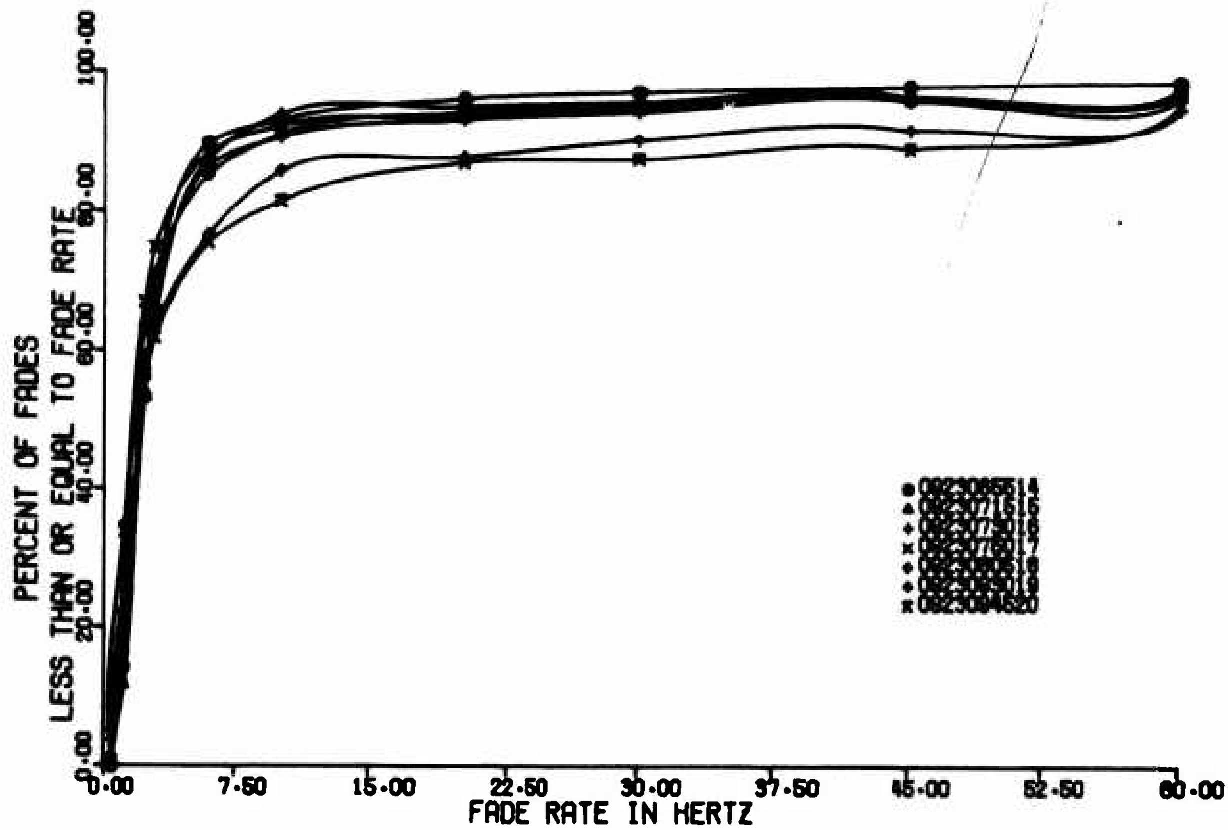


Figure 96. Fade Rate Distribution
Point Petre, September; X-Band

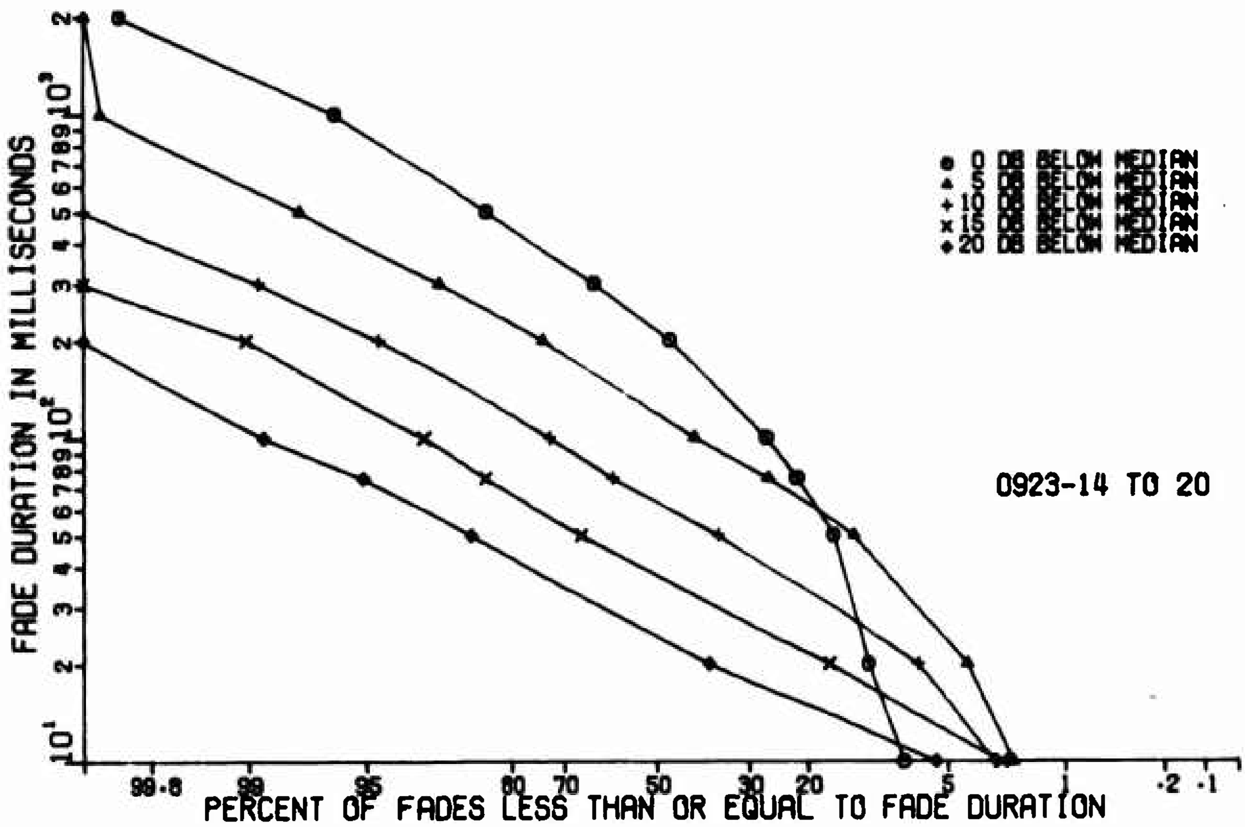


Figure 97. Distribution of Fade Duration
Point Petre, September; X-Band

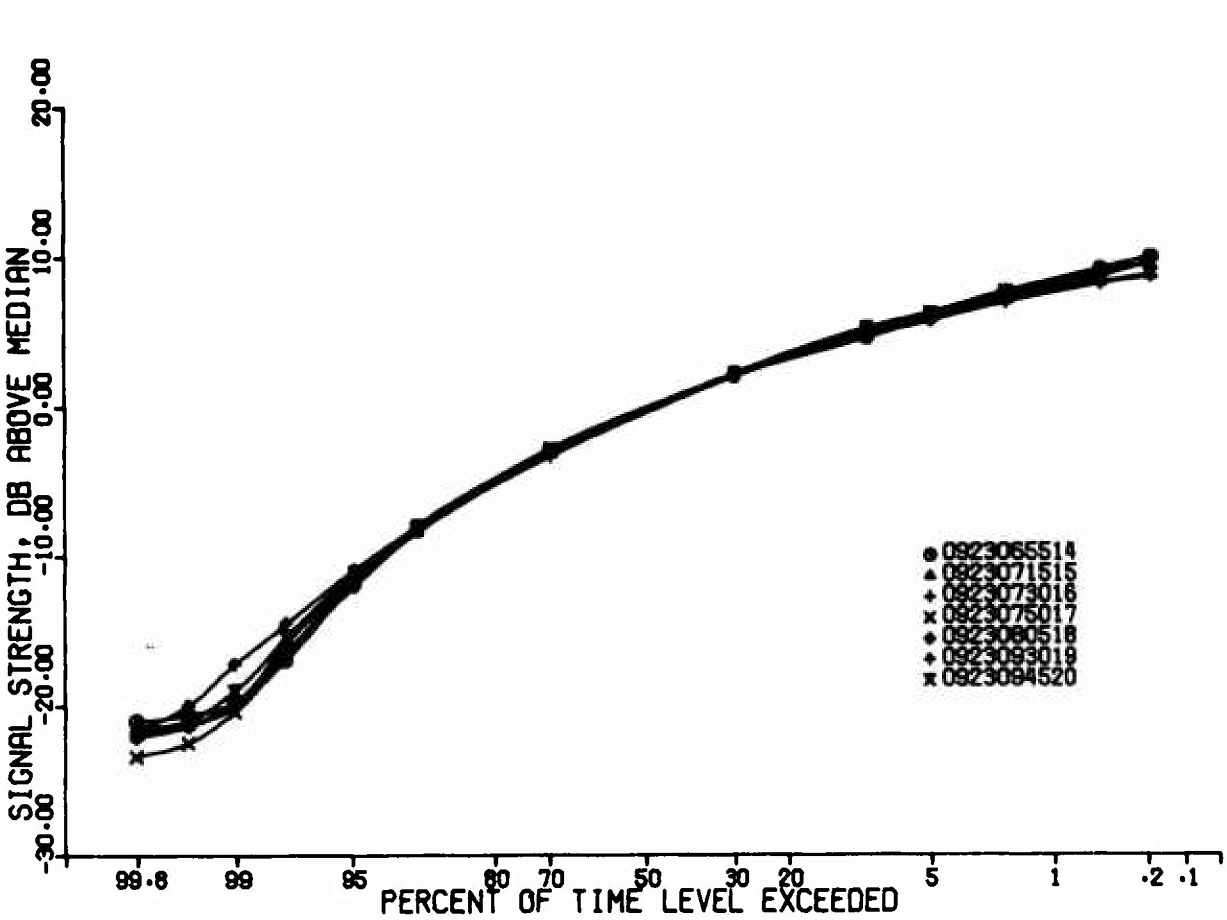


Figure 98. Signal Amplitude Level
Point Petre, September; X-Band

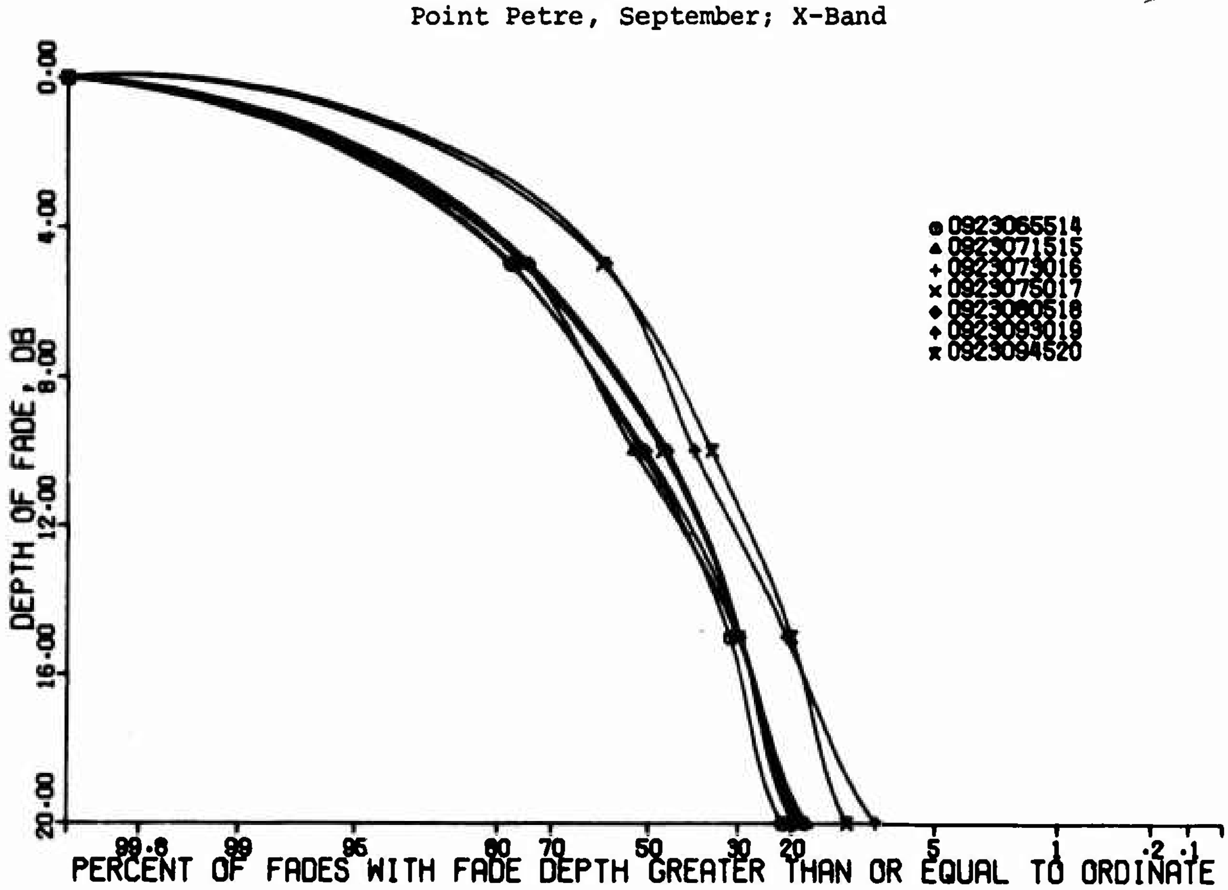


Figure 99. Distribution of Depth of Fades
Point Petre, September; X-Band

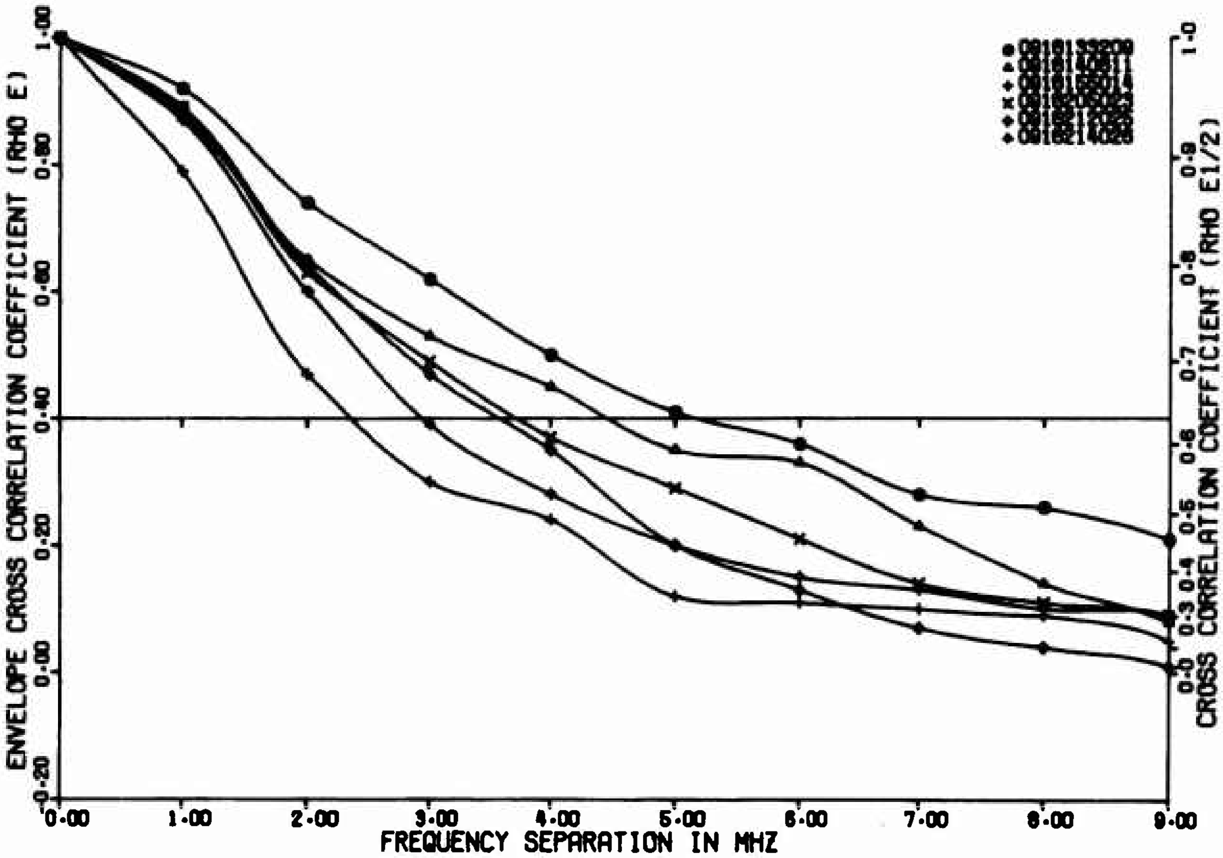


Figure 100. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Wide

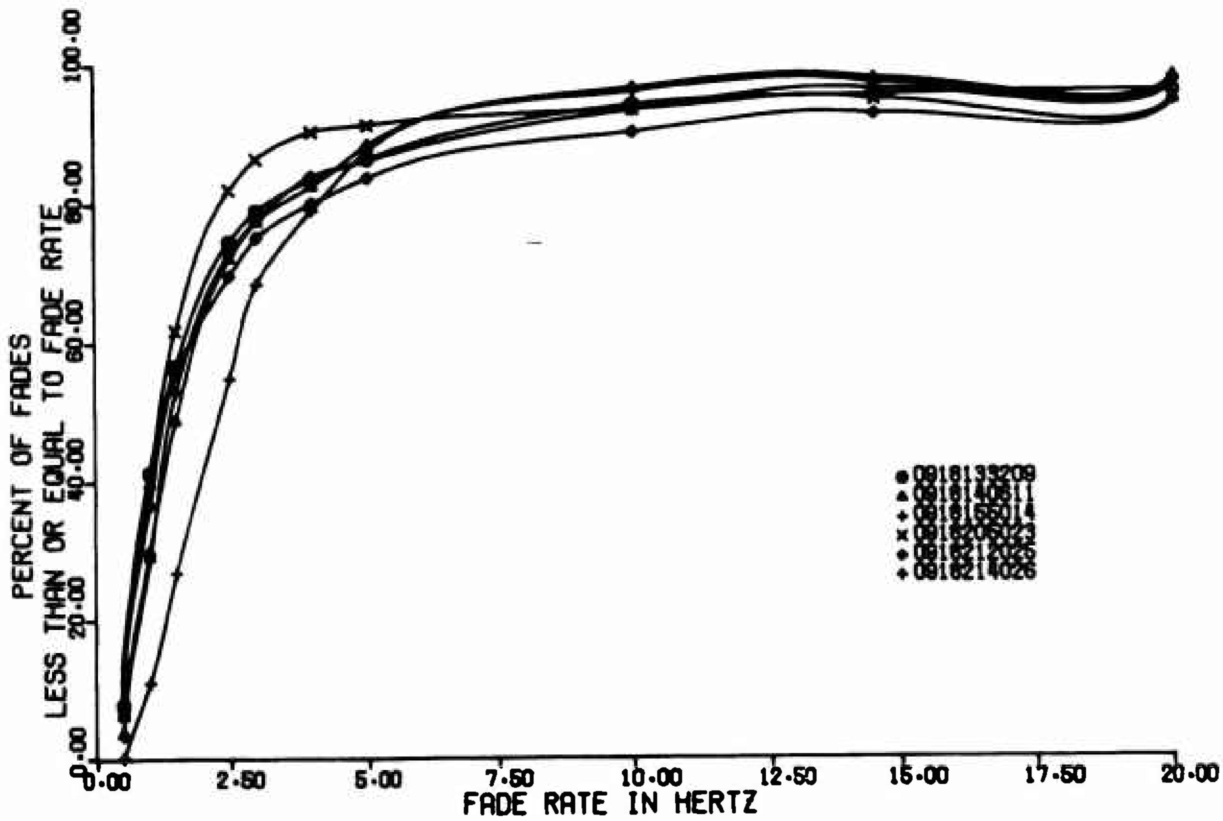


Figure 101. Fade Rate Distribution
Point Petre, September; C-Band

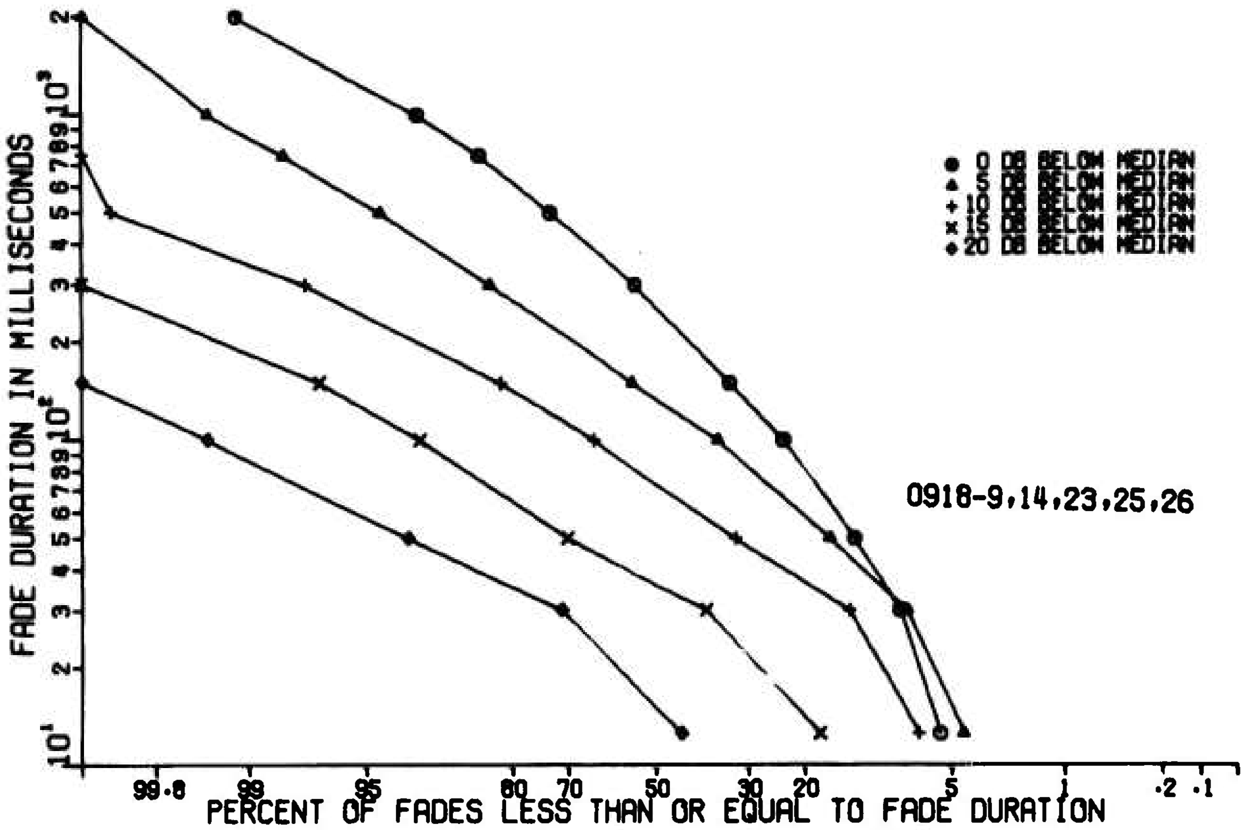


Figure 102. Distribution of Fade Duration
Point Petre, September; C-Band

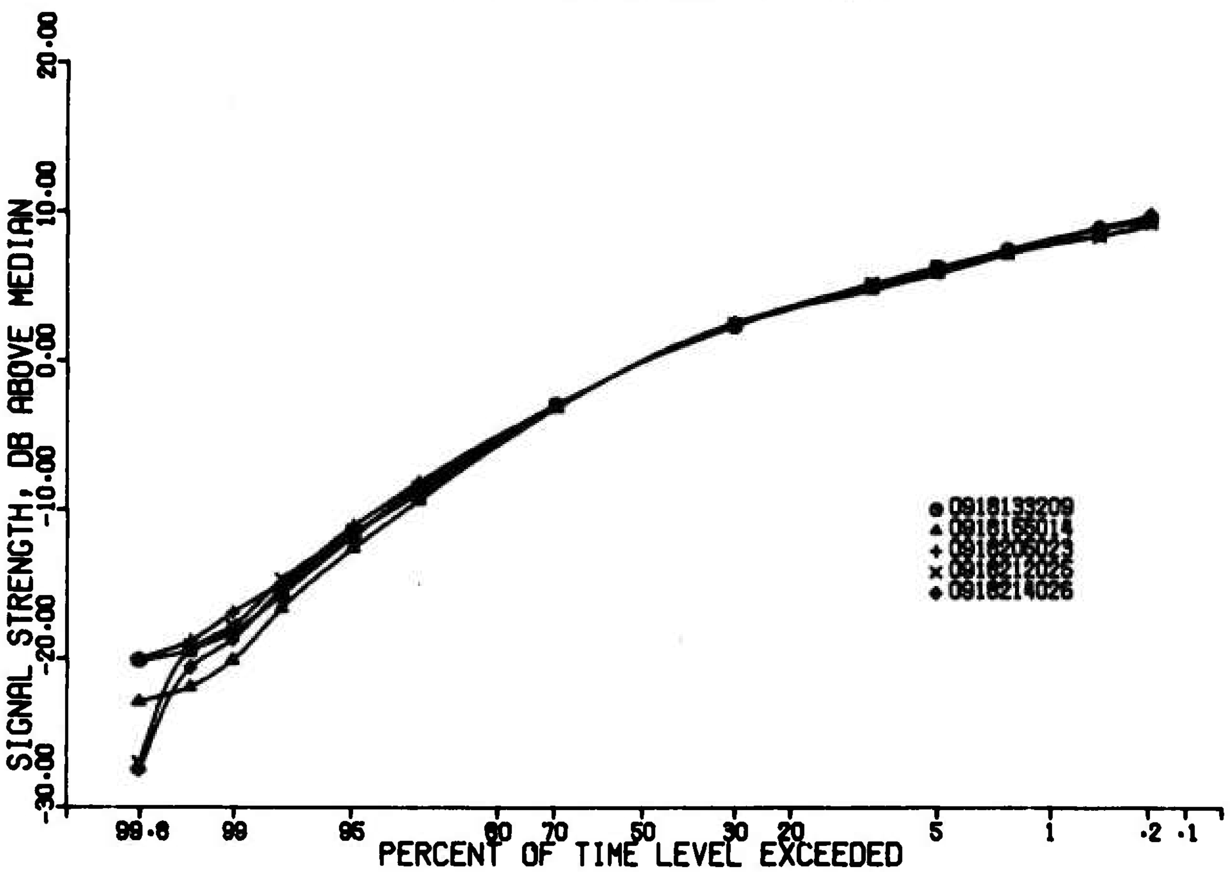


Figure 103. Signal Amplitude Level
Point Petre, September; C-Band

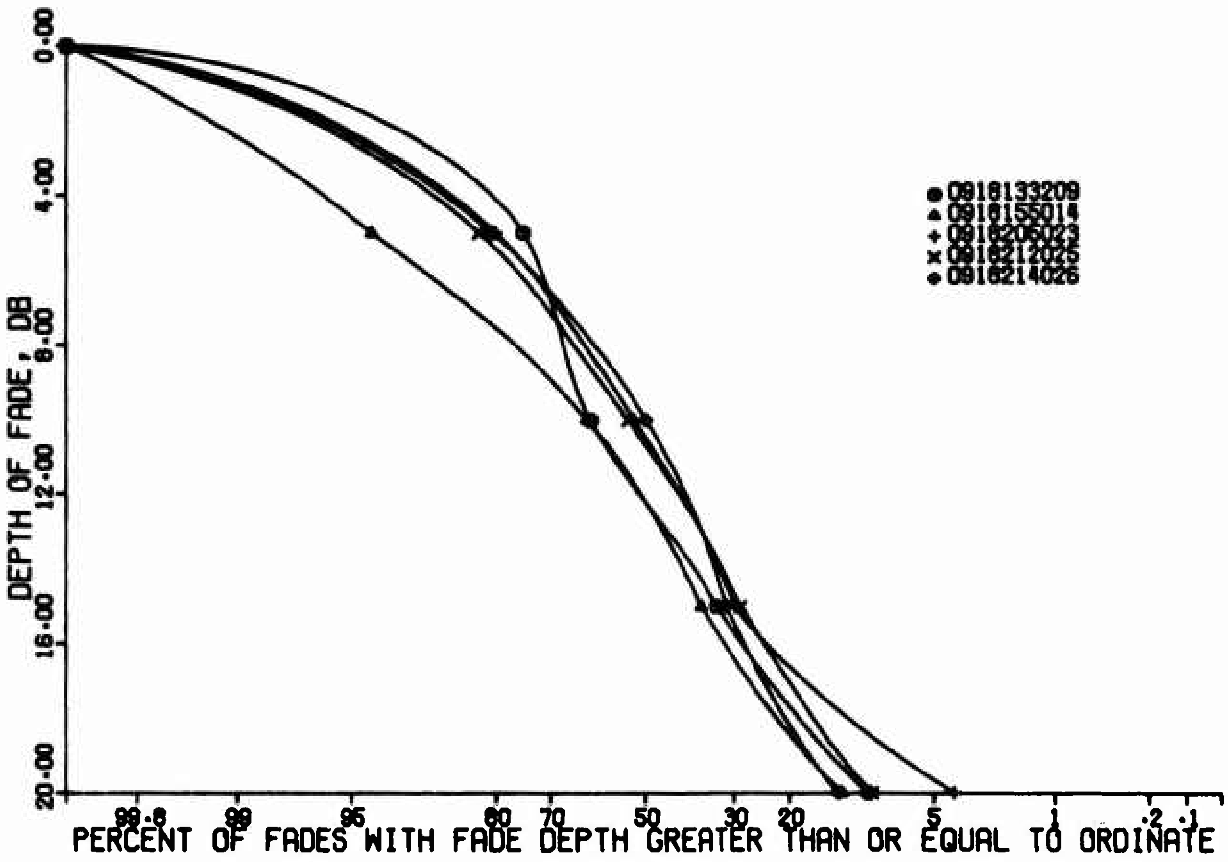


Figure 104. Distribution of Depth of Fades
Point Petre, September; C-Band

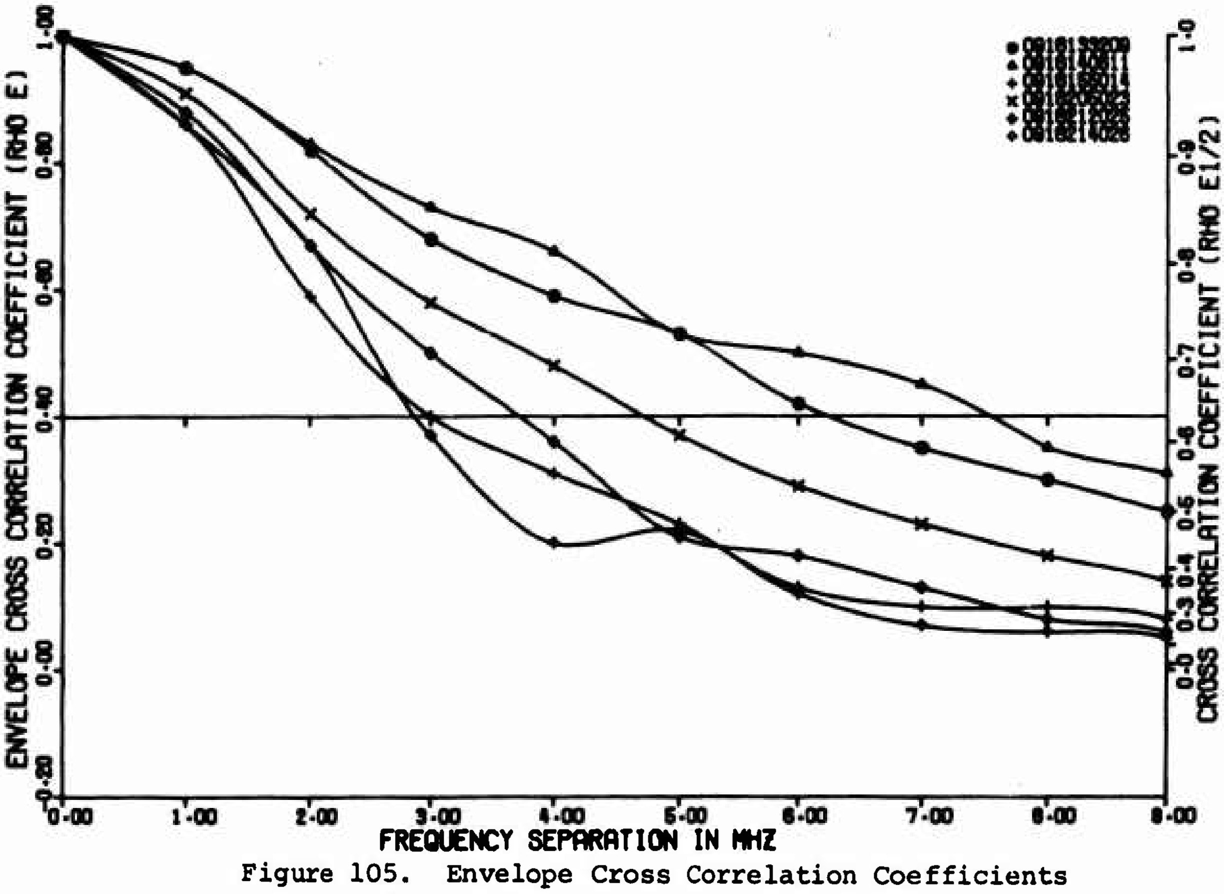


Figure 105. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Wide

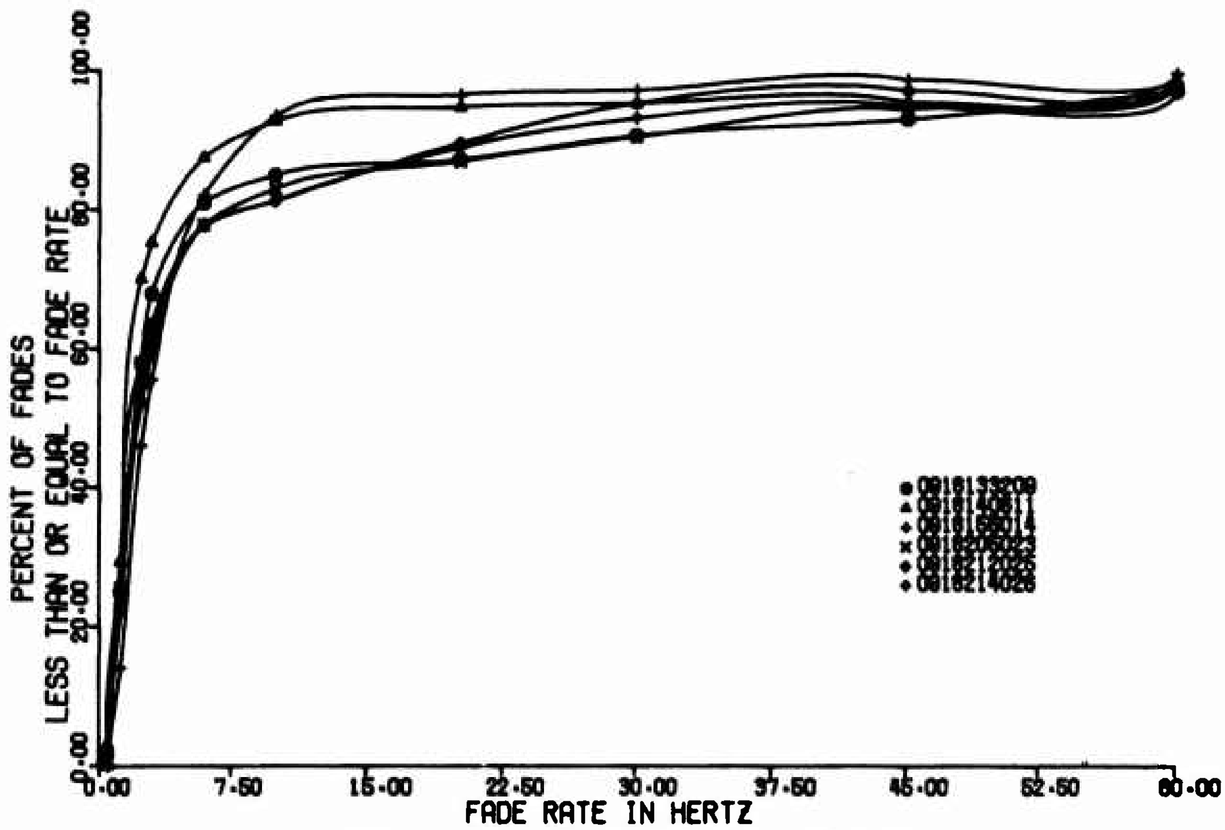


Figure 106. Fade Rate Distribution
Point Petre, September; X-Band

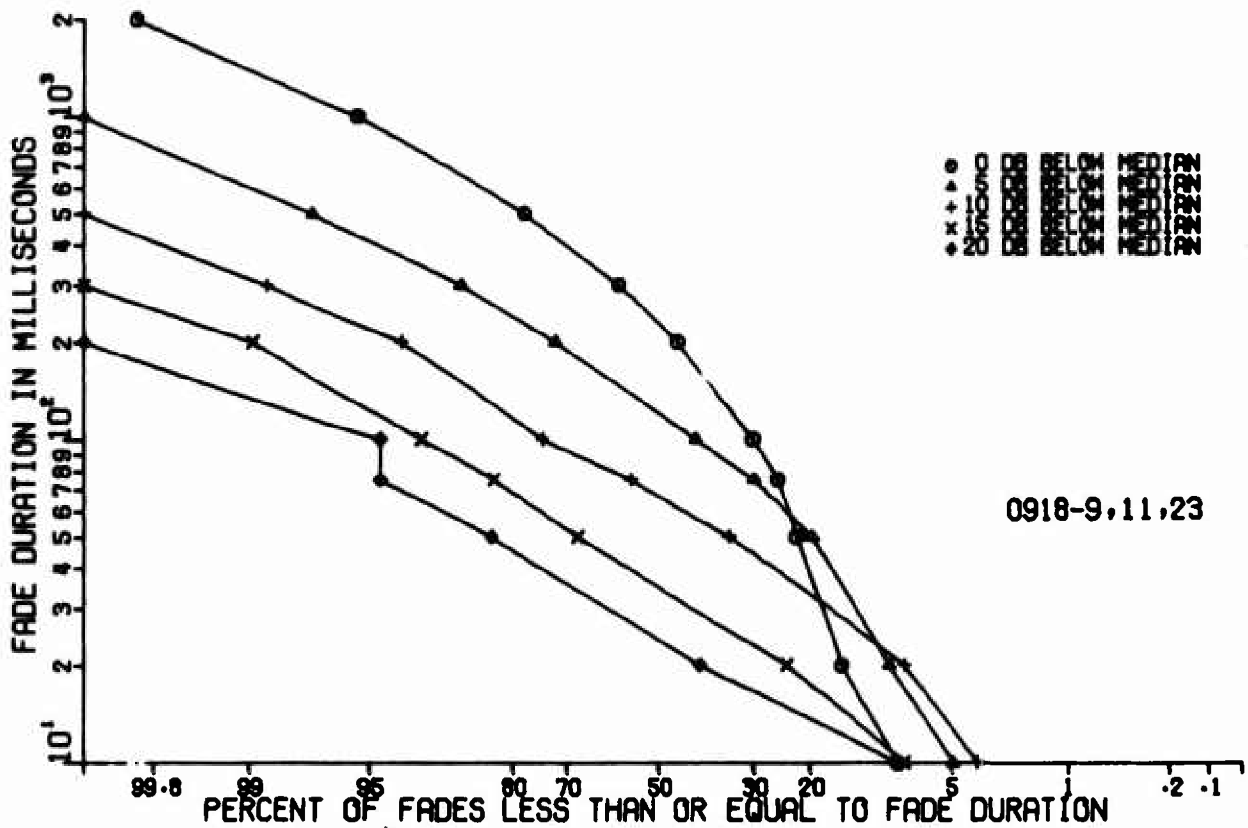


Figure 107. Distribution of Fade Duration
Point Petre, September; X-Band

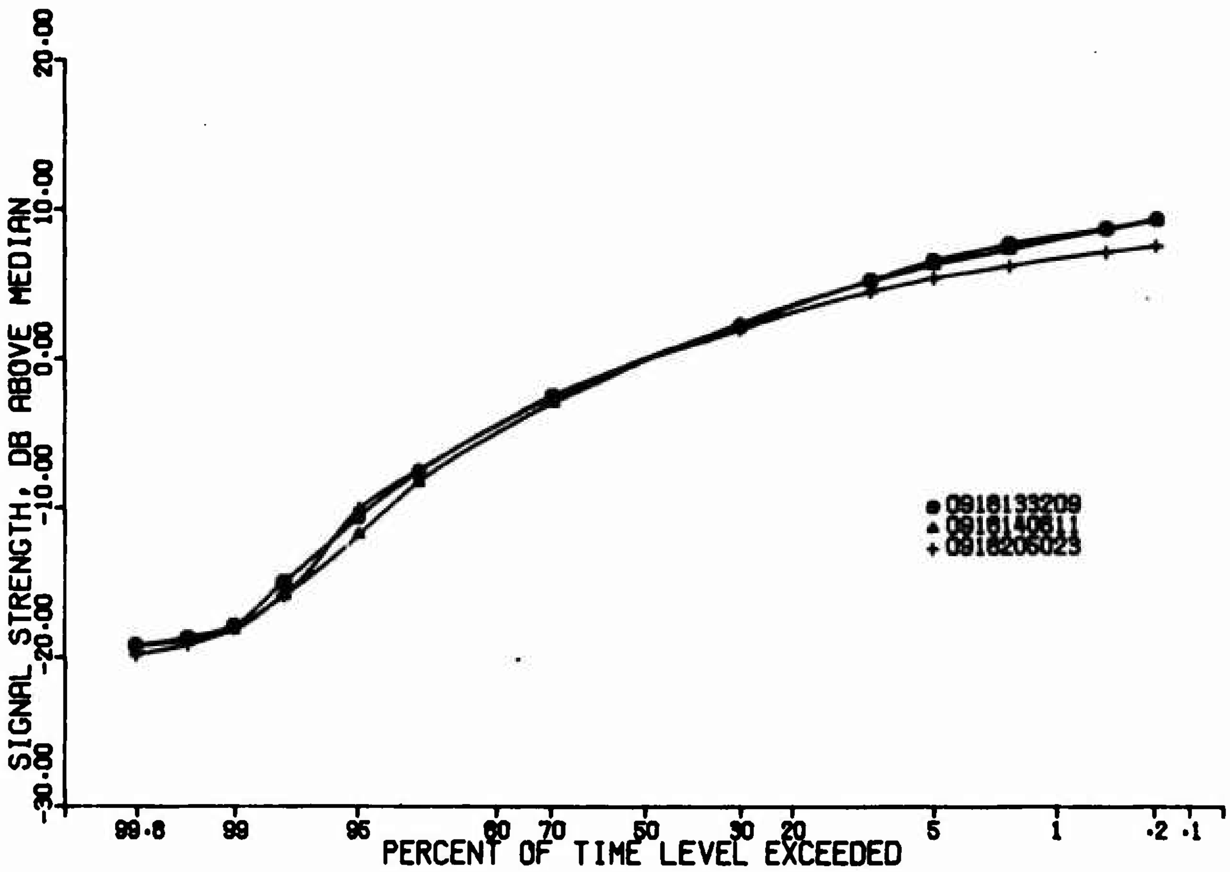


Figure 108. Signal Amplitude Level
Point Petre, September; X-Band

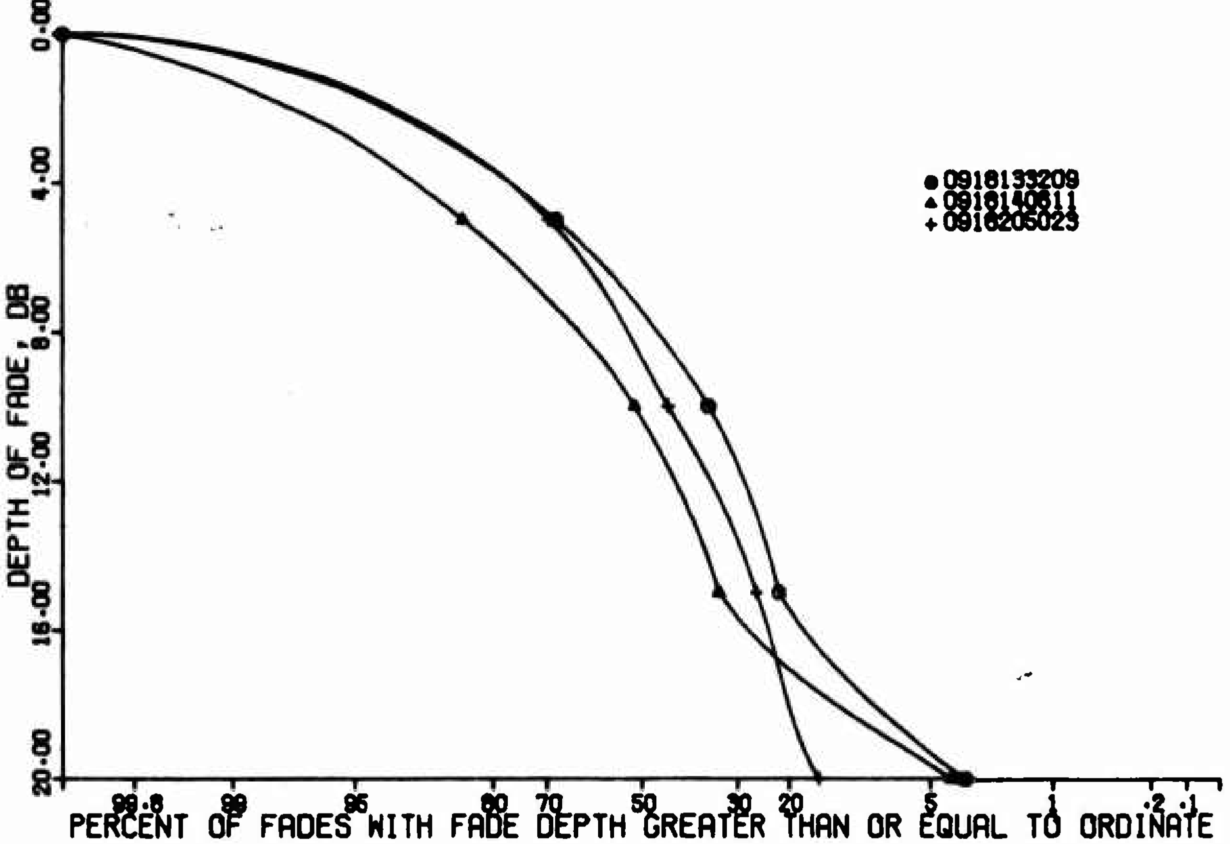


Figure 109. Distribution of Depth of Fades
Point Petre, September; X-Band

E. ANOMALIES IN PROPAGATION

The anomalous propagation is by its own definition due to phenomena which occur seldom and therefore merits only minor consideration in the design of modems for transmission through troposcatter. These unusual phenomena result in ducting with its usual associated high signal strength, unusually high fade rates, fluttering caused by aircraft, and unusual shapes in the correlation coefficient versus frequency curves. Some samples of each of these phenomena are included in the following paragraphs with some comments regarding the performance of frequency diversity modems during these anomalies.

1. Ducting

Ducting signals are identified by their relatively high signal strengths and often low depth of fades accompanied usually by a wide correlation bandwidth. However, the high signal strength is the only common denominator observed in all ducting situations identified during this test. Figures 110 through 113 show a case of X-band ducting at Ontario Center on 11 August. A cross correlation is shown to be very wide, but the fades on which the computation was made are very shallow and seldom more than 5 dB below the median. The fade rate is enormous with 10 percent of the fades greater than 60 Hz. In this situation the signal strengths were in the vicinity of -60 dBm. A short time later the C band was ducting with the results shown in Figures 114 through 117. Here the correlation bandwidth is narrow with some fades greater than 5 dB. The signal strength was about -66 dBm.

Ducting has little or no adverse effect on the frequency-time matrix type of modem that obtains diversity by the use of a number of frequencies because the diversity is not needed when the signal strength is high enough to provide sufficient fade margin to avoid digital errors. Adaptive frequency modems have no difficulty as long as their frequency commands to the receiver are properly decoded because it does not matter which frequency the modems operate on in high signal level as long as both transmitter and receiver are both on the same frequency. The occassional deep fade might cause an error in the decoding of a frequency command. The link would become broken until the time-out and start-up have been reinitiated.

Another case of ducting occurred at Point Petre where evidently the C band was experiencing a more classic case while X band was not fully ducting. Figures 118 through 122 show the C-band propagation and Figures 123 through 127 show the X band. The signal strength was -76 dBm for X band and -66 dBm for C band. The C-band ducting had the wide correlation bandwidth, very high fade rates with mostly shallow fades of which 80 percent were less than 4 dB. The unexpected phenomenon is that the X band was not strictly ducting. True, it had a wide correlation bandwidth most of the time, but the fade rates were within typical bounds and so were the signal amplitude, fade duration, and depth distributions. In this type of environment the frequency-time modem would operate with some diversity gain because the correlation coefficient dropped to about 0.8 in 2 MHz which is known to yield most of the diversity improvement (Reference 2). The adaptive frequency modem should operate in this environment reasonably well, subject of course to the occasional breaking of the link due to erroneous frequency change commands.

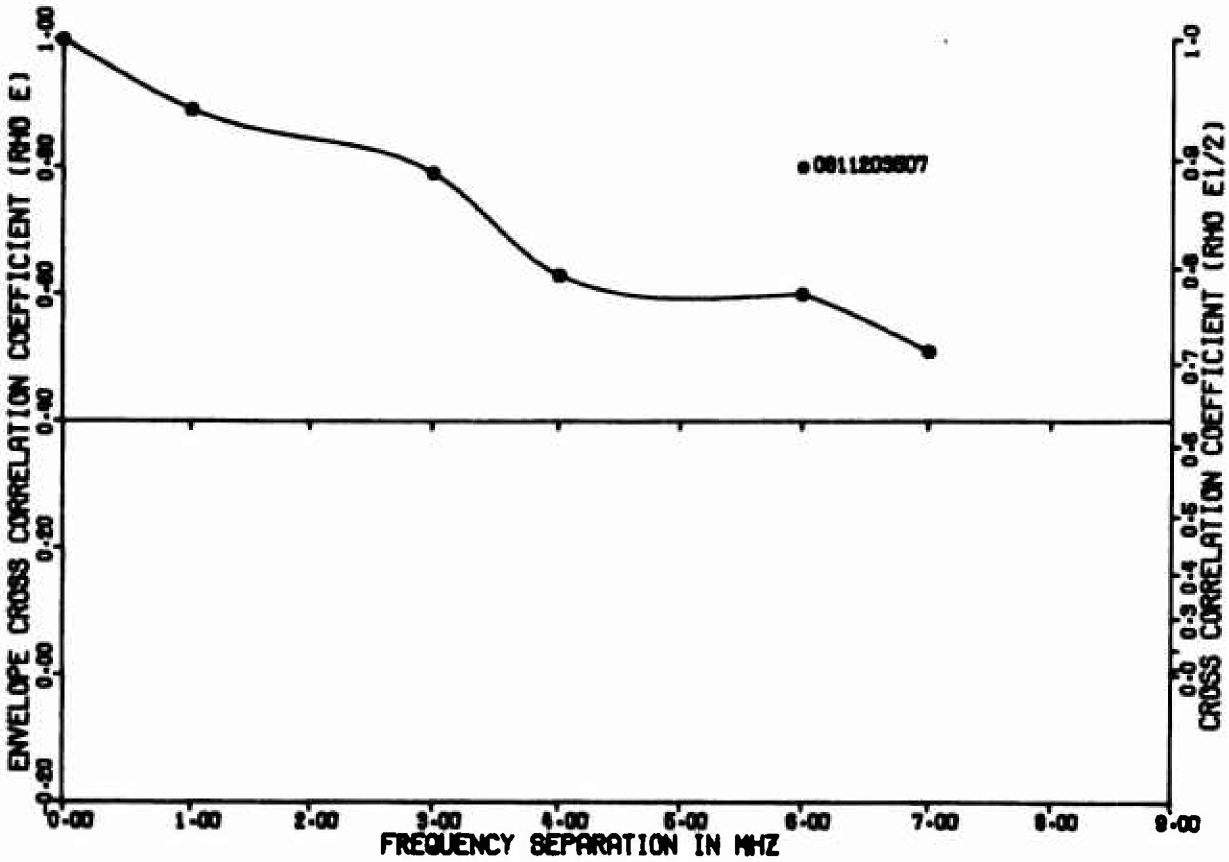


Figure 110. Envelope Cross Correlation Coefficients
Ontario Center, Summer; X-Band, Wide, Ducting

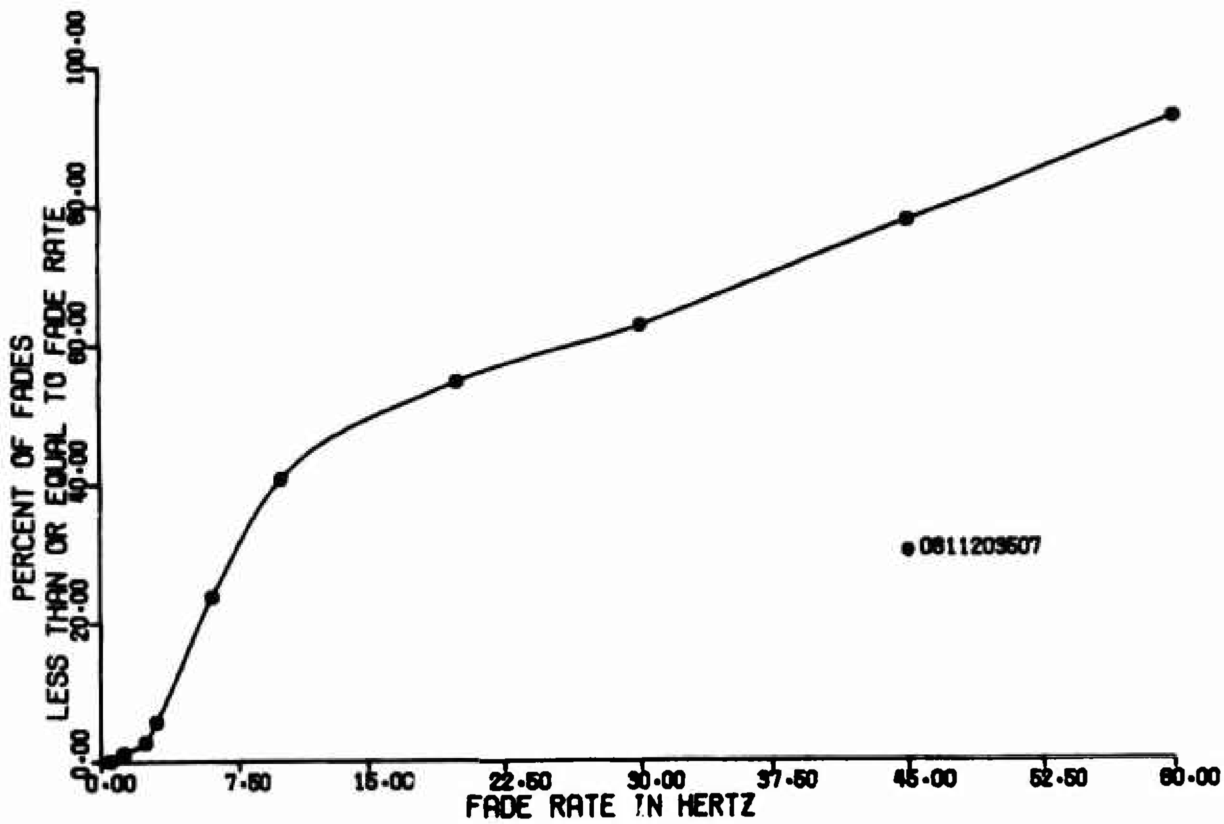


Figure 111. Fade Rate Distribution
Ontario Center, Summer; X-band, Ducting

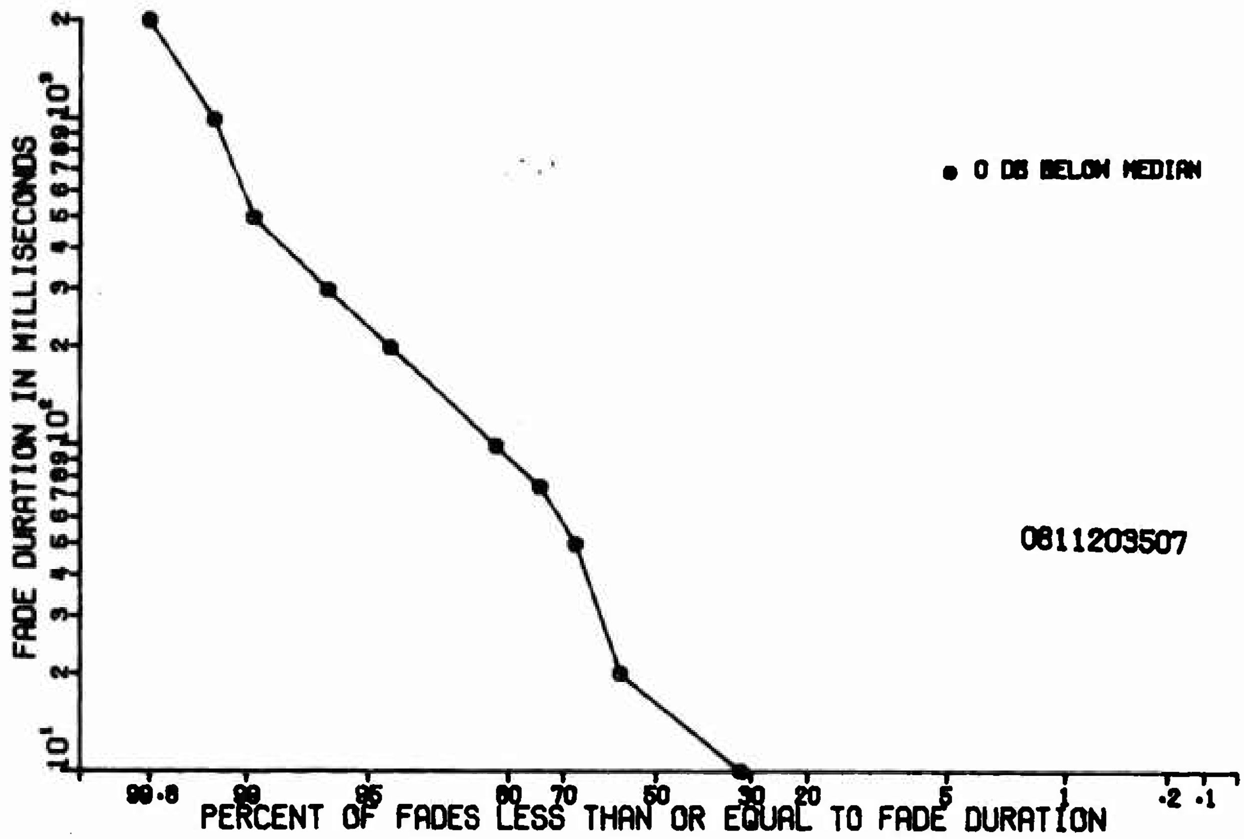


Figure 112. Distribution of Fade Duration
Ontario Center, Summer; X-Band, Ducting

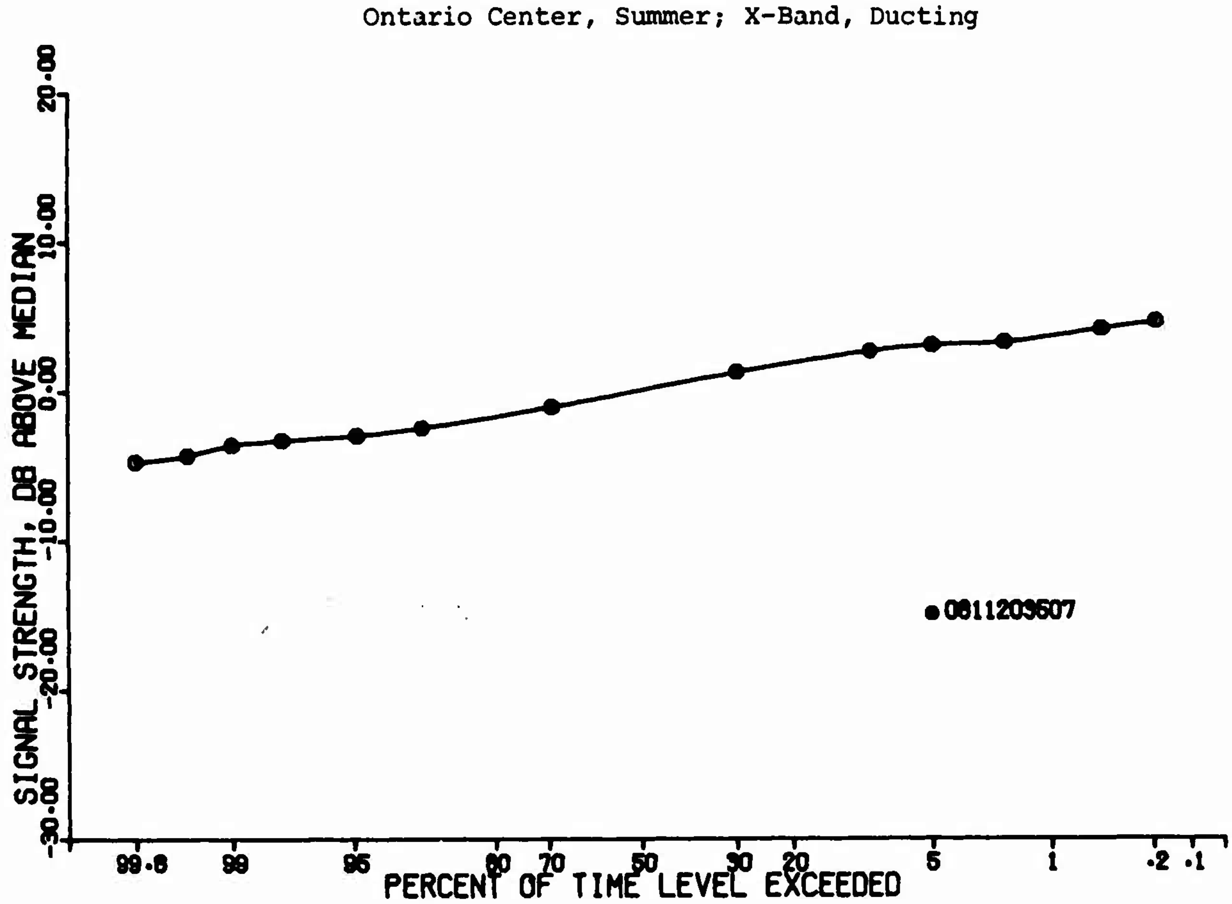


Figure 113. Signal Amplitude Level
Ontario Center, Summer; X-Band, Ducting

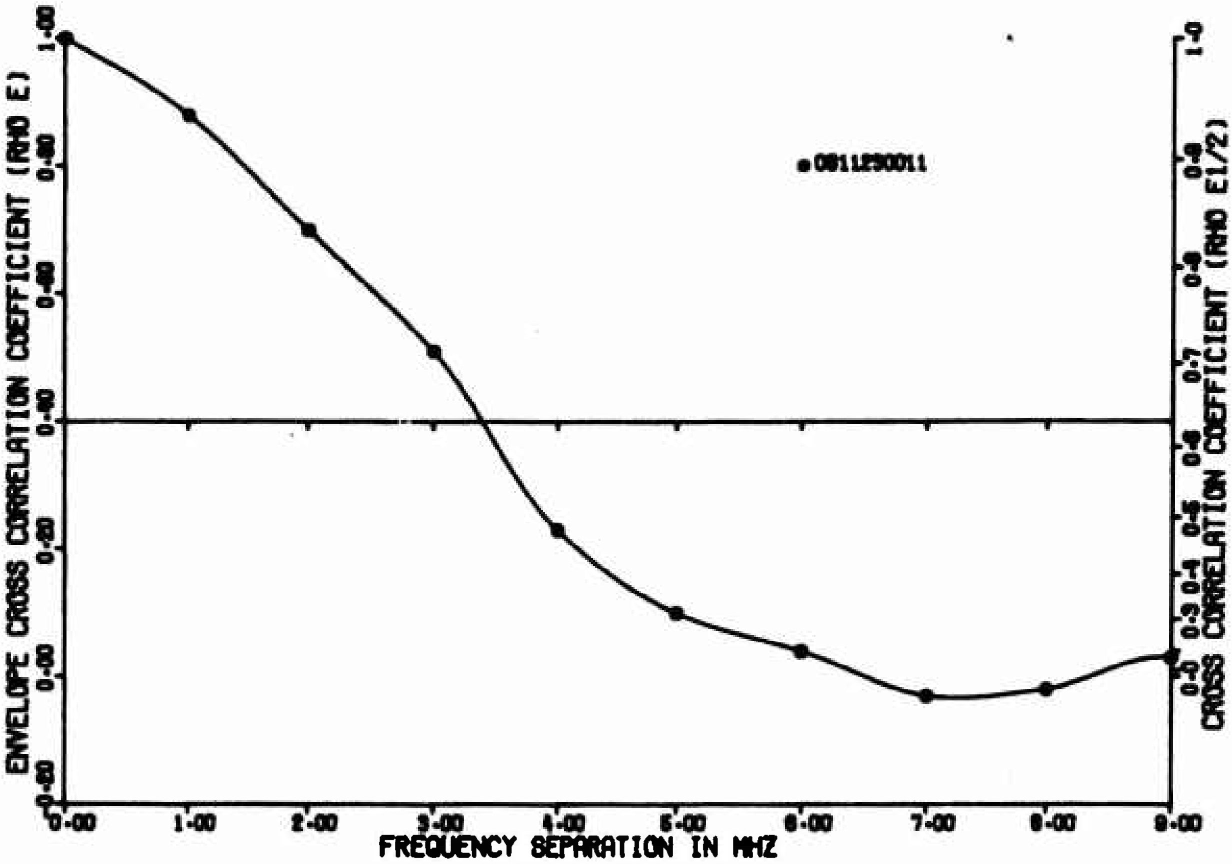


Figure 114. Envelope Cross Correlation Coefficients
Ontario Center, Summer; C-Band, Wide, Ducting

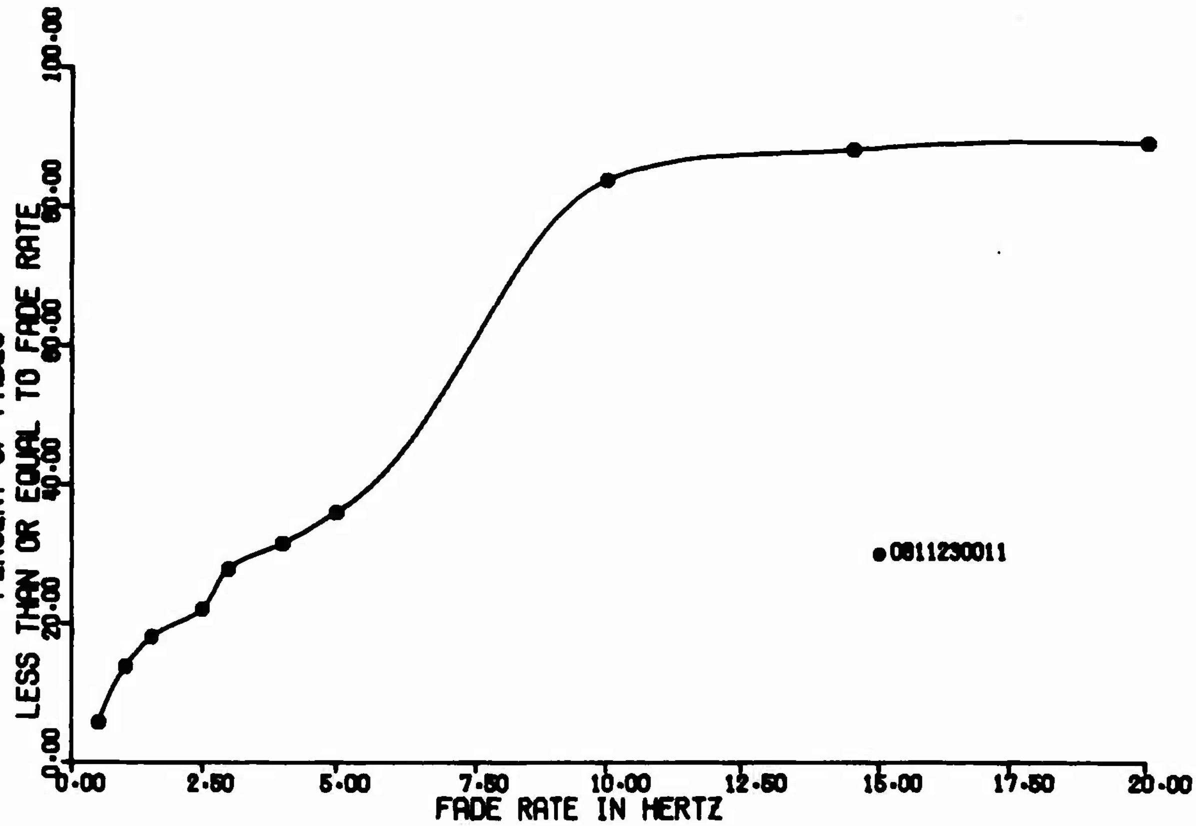


Figure 115. Fade Rate Distribution
Ontario Center, Summer; C-Band, Ducting

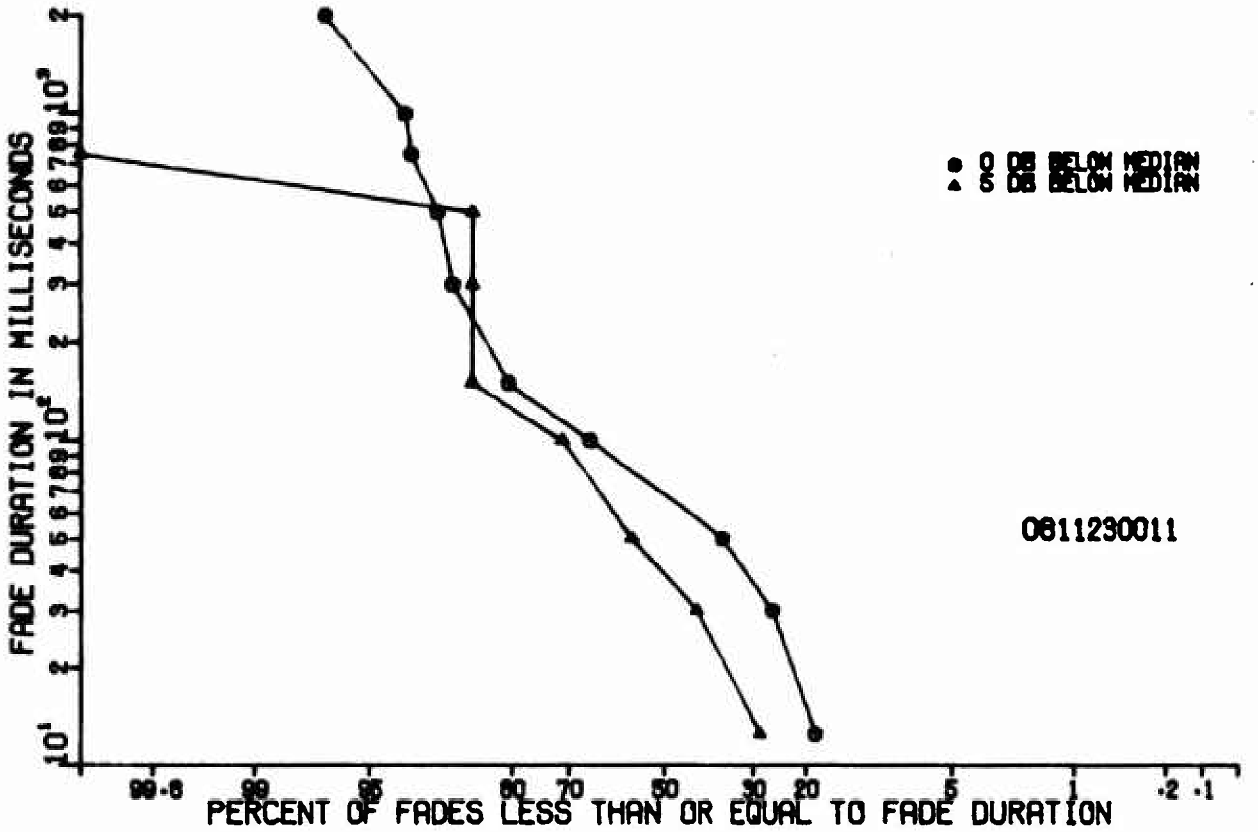


Figure 116. Distribution of Fade Duration
Ontario Center, Summer; C-Band, Ducting

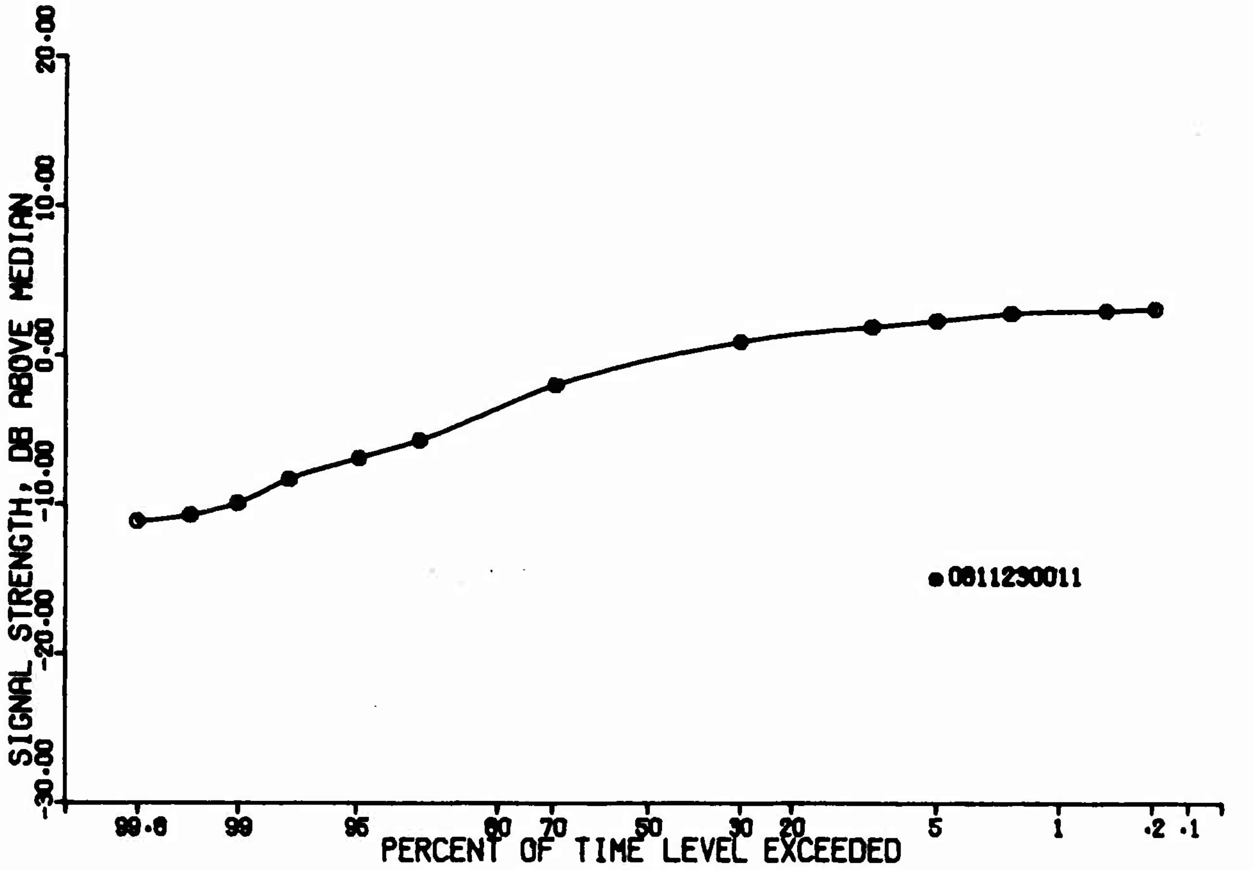


Figure 117. Signal Amplitude Level
Ontario Center, Summer; C-Band, Ducting

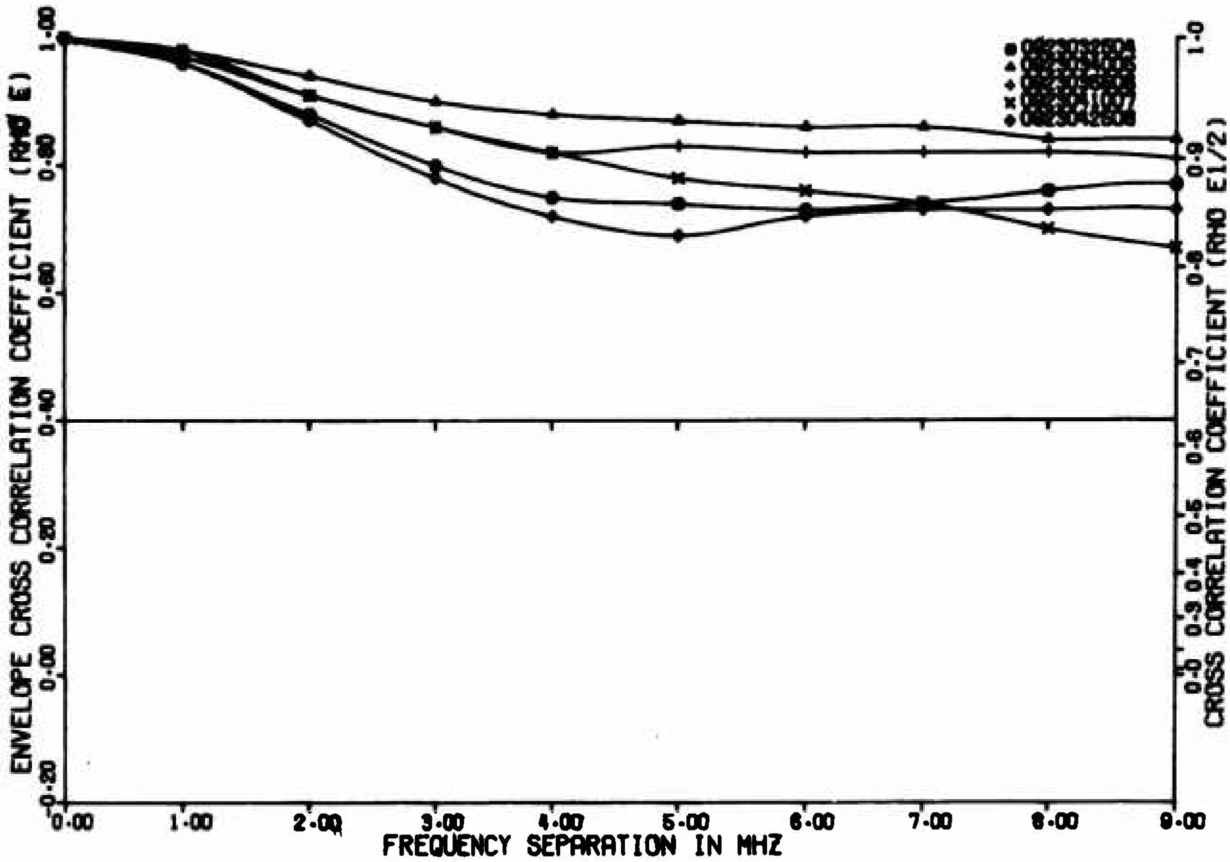


Figure 118. Envelope Cross Correlation Coefficients
Point Petre, September; C-Band, Wide

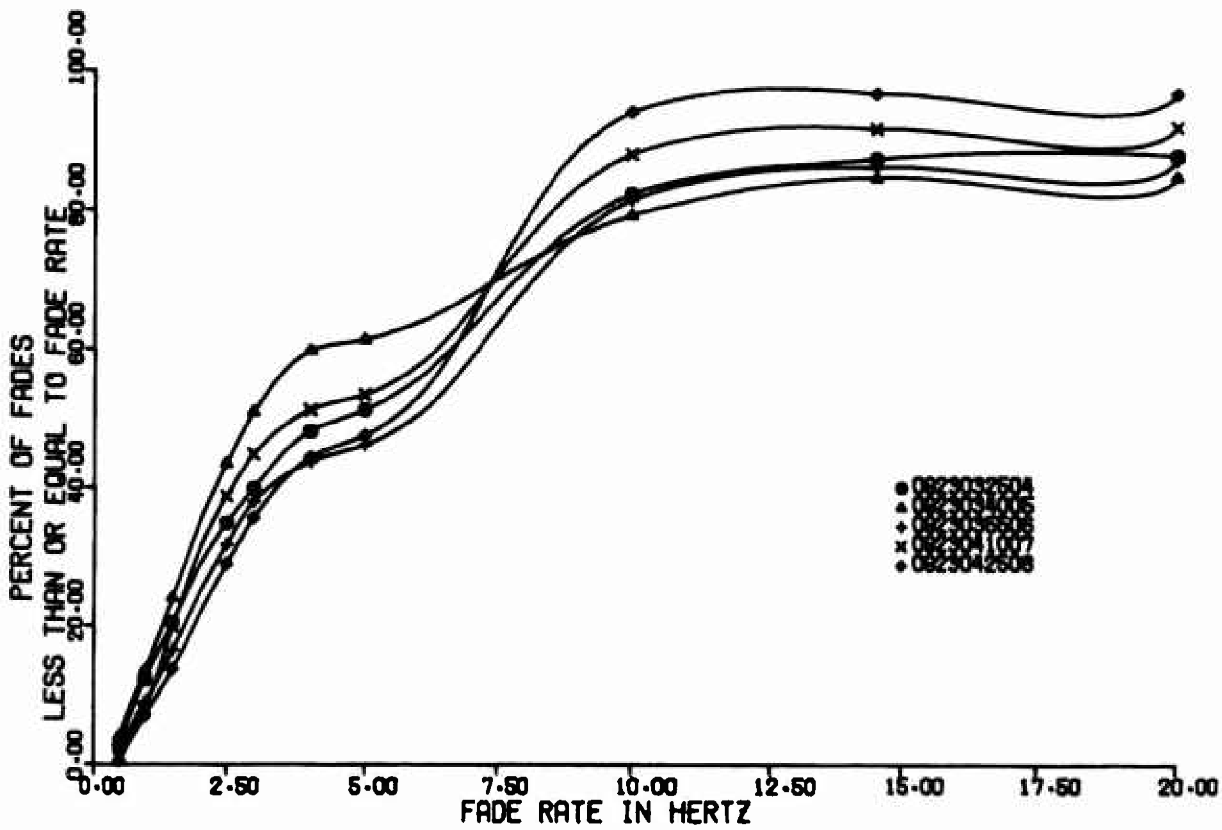


Figure 119. Fade Rate Distribution
Point Petre, September; C-Band

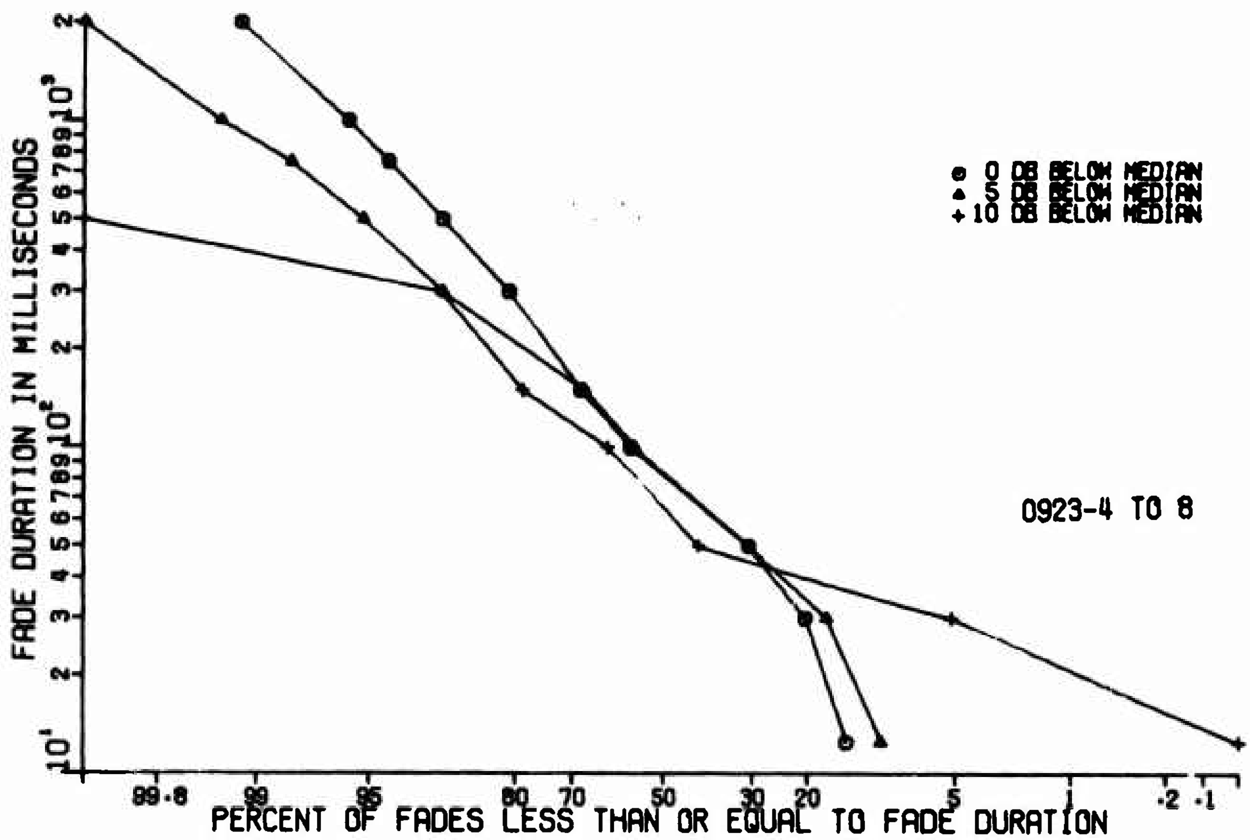


Figure 120. Distribution of Fade Duration
Point Petre, September; C-Band

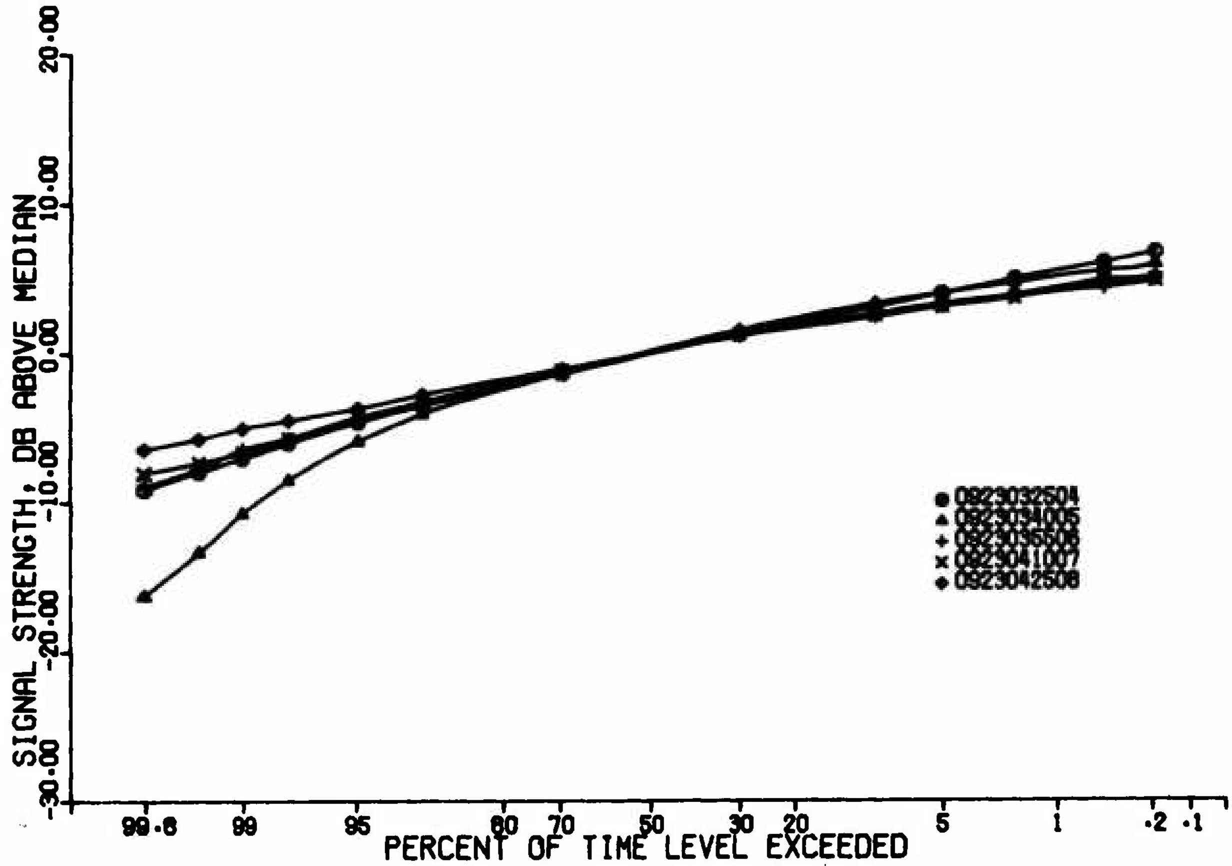


Figure 121. Signal Amplitude Level
Point Petre, September; C-Band

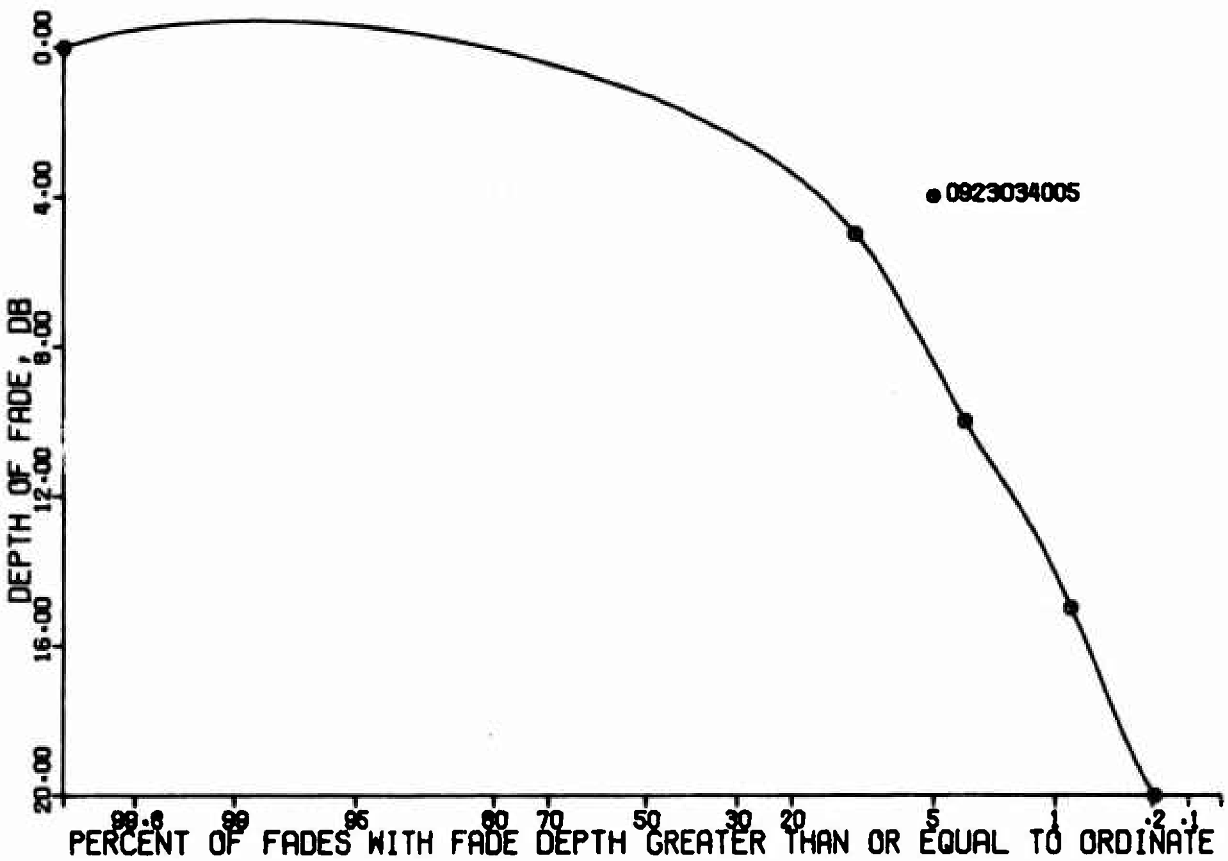


Figure 122. Distribution of Depth of Fades
Point Petre, September; C-Band

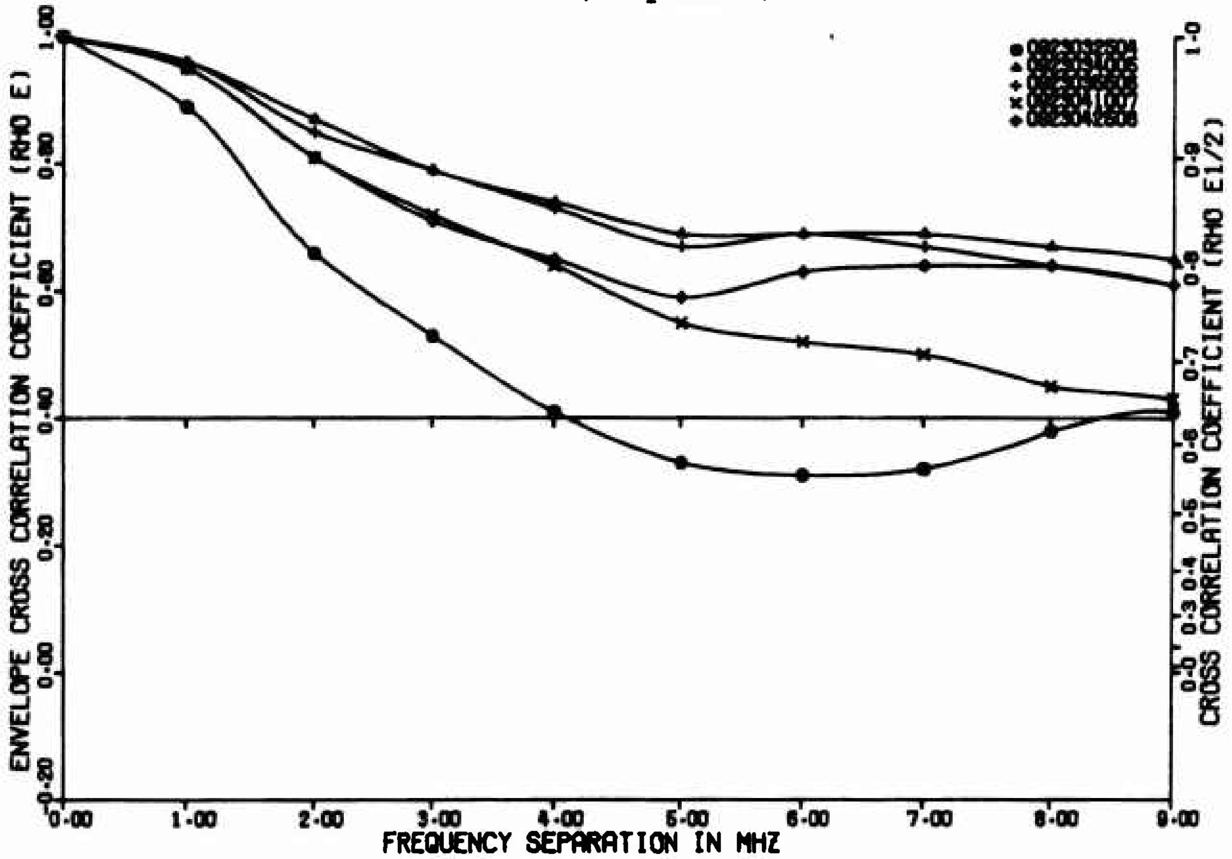


Figure 123. Envelope Cross Correlation Coefficients
Point Petre, September; X-Band, Wide

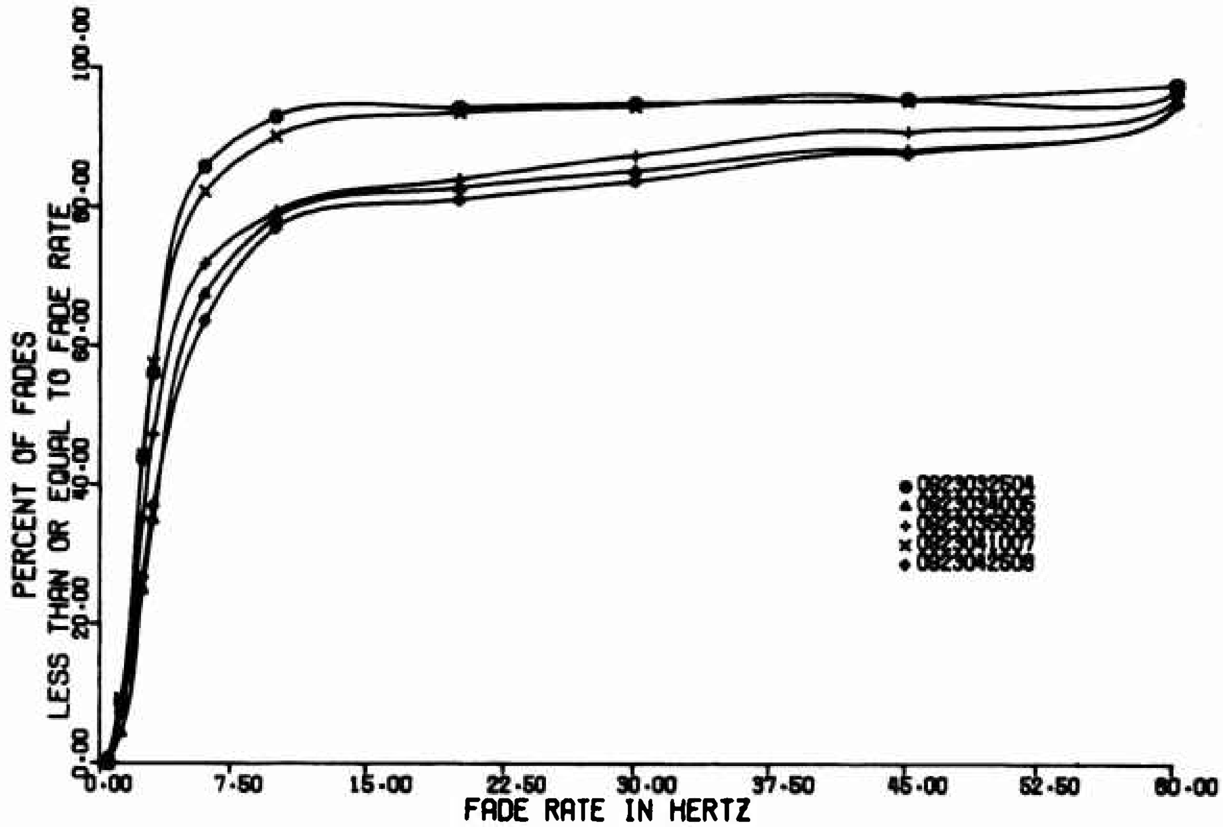


Figure 124. Fade Rate Distribution
Point Petre, September; X-Band

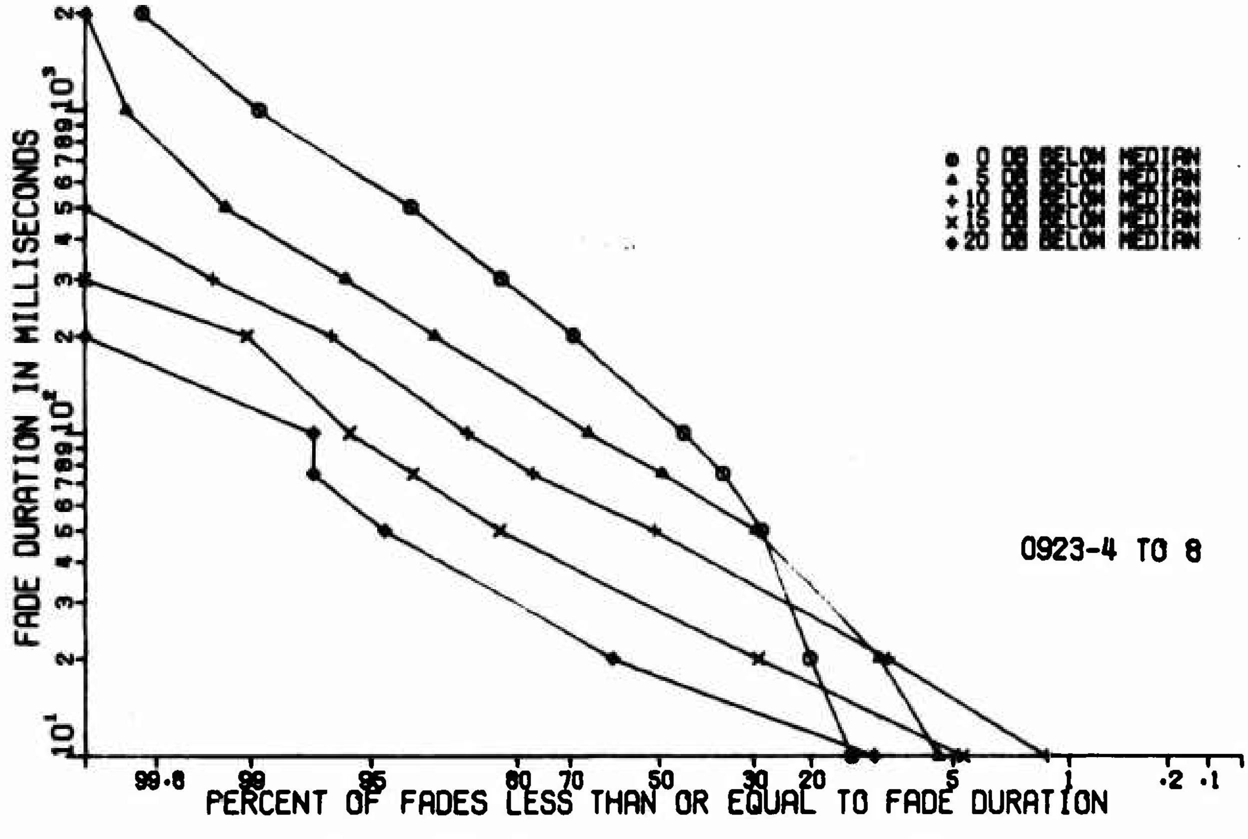


Figure 125. Distribution of Fade Duration
Point Petre, September; X-Band

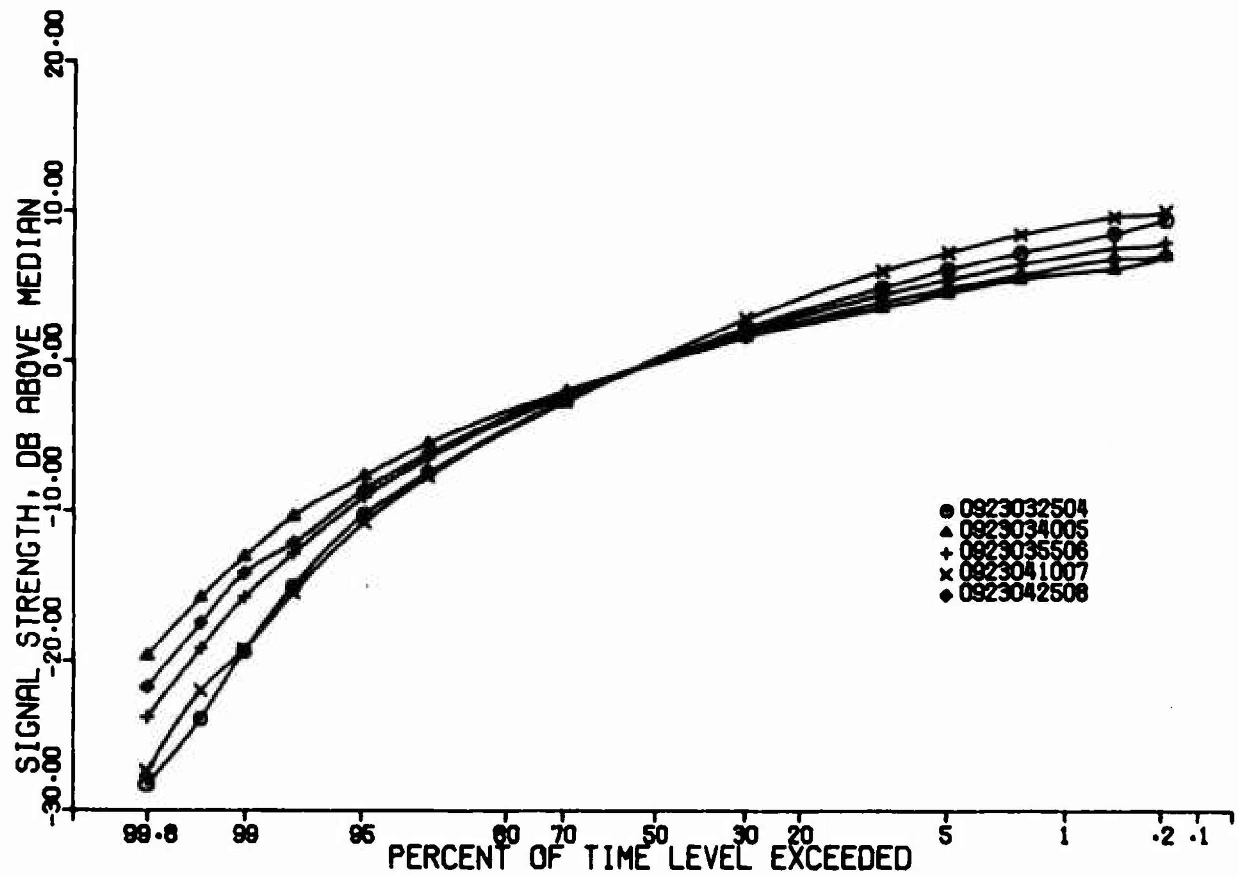


Figure 126. Signal Amplitude Level
Point Petre, September; X-Band

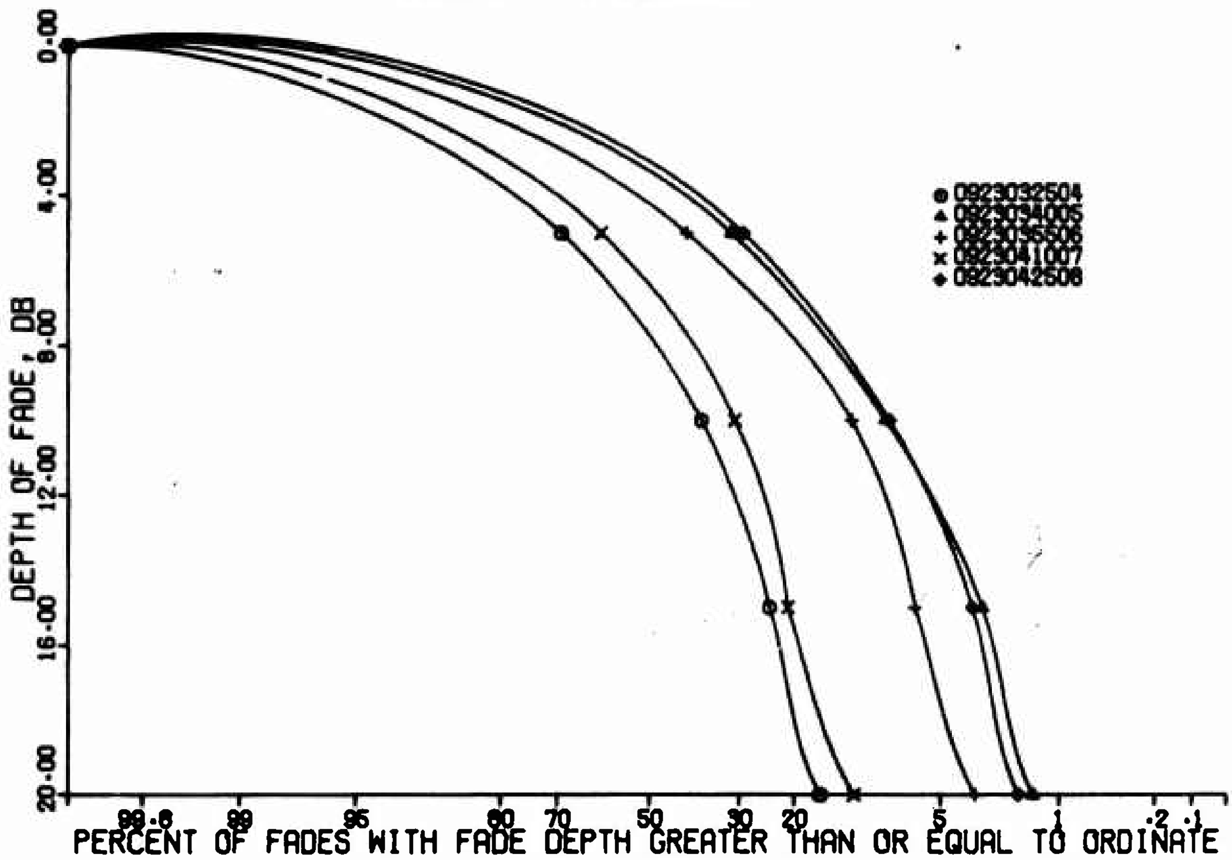


Figure 127. Distribution of Depth of Fades
Point Petre, September; X-Band

2. Aircraft Effects

Aircraft effects should not be called an anomalous condition because it is a condition often present in both military and civilian environments. The presence of the aircraft for a short interval has very little effect on a statistical test of relatively long time duration. In fact, its effect is only noticeable for the short period that the aircraft is directly in the beam. Figures 128 and 129 show the presence of the aircraft by the rise in correlation coefficient, but has little effect on the overall test. The fade rates shown in Figures 130 and 131 are averaged over the entire test number 15 and 13 to indicate that the effect is noticeable over the entire test, but during the time that the aircraft were actually present in the beam the fade rates were much higher than shown on the curves.

The frequency-time modems can operate through this type of environment. The adaptive frequency modems were found to have difficulty due to the high fade rates in Reference 2.

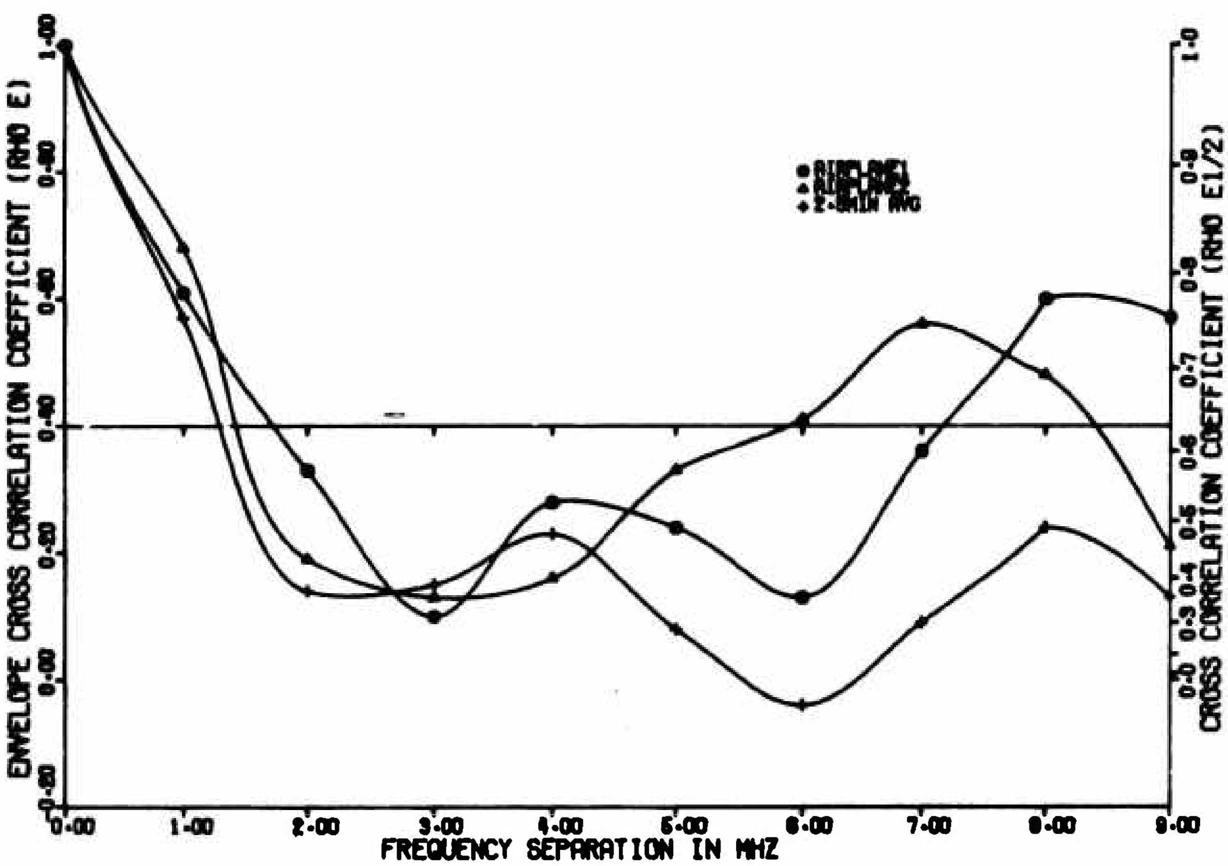


Figure 128. Envelope Cross Correlation Coefficients
Ontario Center, Summer; X-Band, Wide; Airplane Effect 1

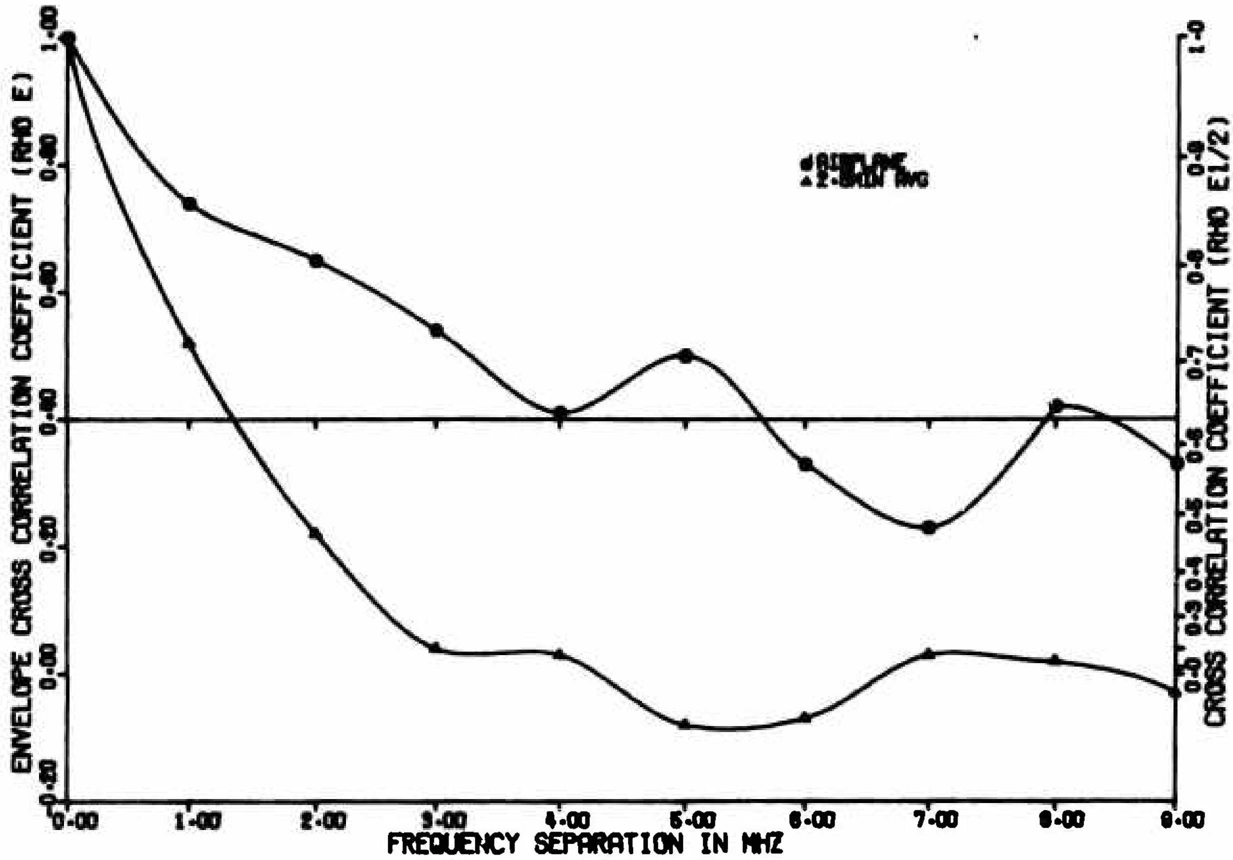


Figure 129. Envelope Cross Correlation Coefficients
Ontario Center, Summer; X-Band, Wide; Airplane Effect 2

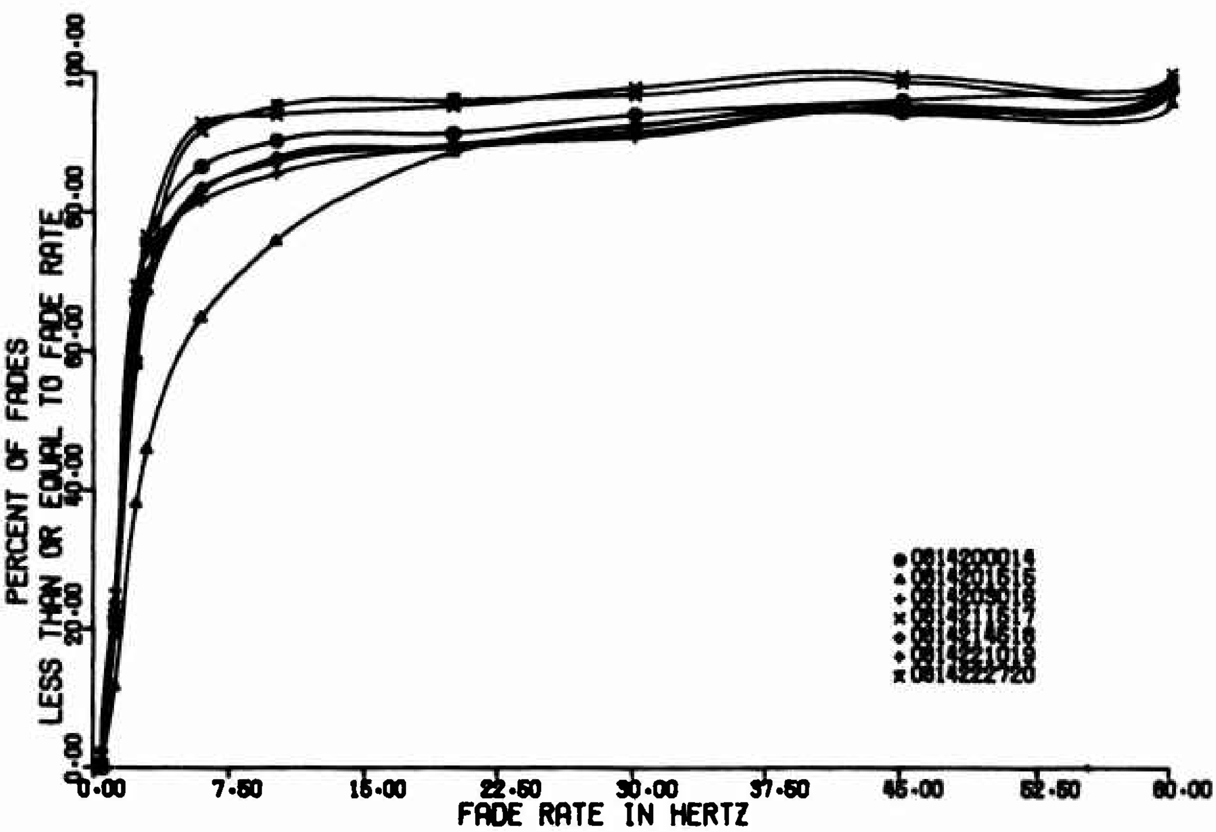


Figure 130. Fade Rate Distribution
Ontario Center, Summer; X-Band

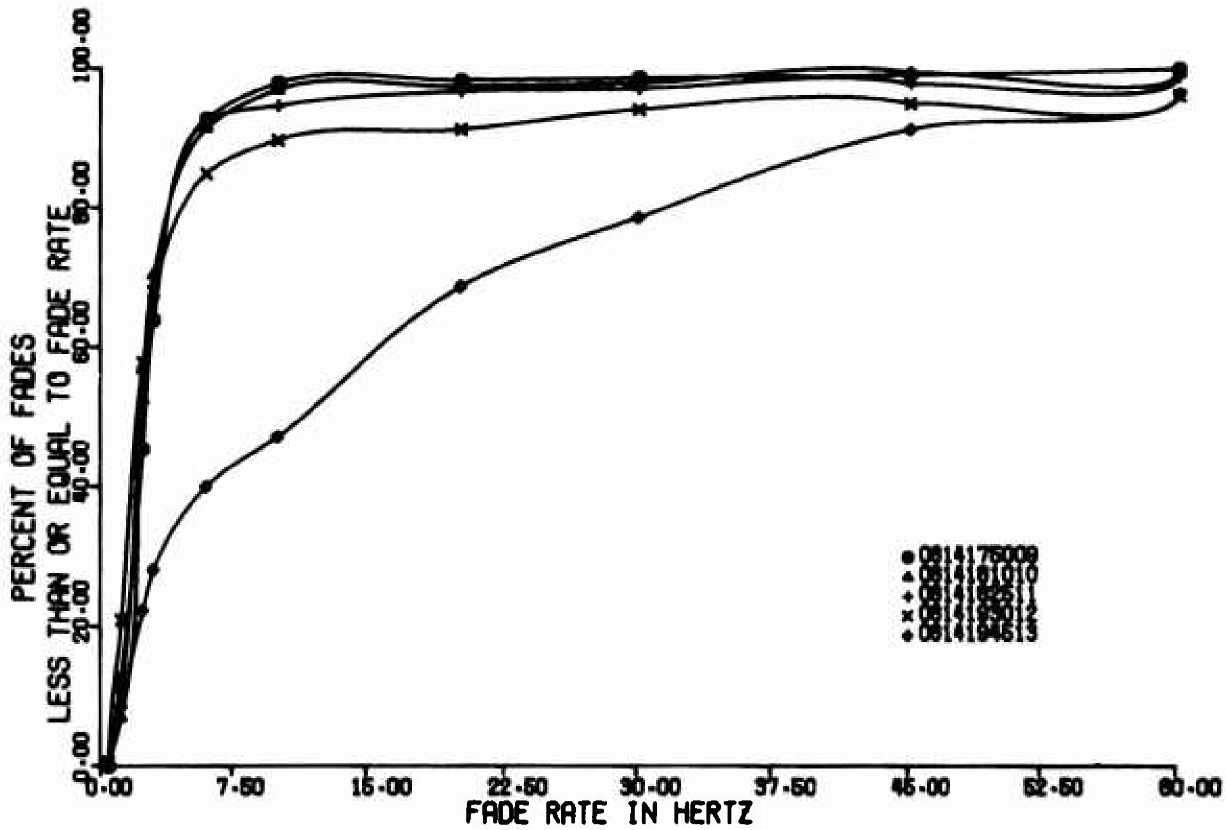


Figure 131. Fade Rate Distribution
Ontario Center, Summer; X-Band; Temperature Over 85°F

3. Unusual Shape in the Correlation Coefficient Curves

Some unusual shapes in the correlation coefficient curves were noted often enough to consider them as perhaps a part of the fading and multipath mechanism occasionally present in the common volume. This phenomenon was not observed in the previous troposcatter propagation work in Reference 2. If it were present, it went undetected. The correlation bandwidth curves are presented in Figures 132 and 133 because they might give a clue to the behavior of the common volume. The curves appear as if they are following some sort of sine x/x function. In Figure 132 it appears suddenly in test 12 at 1930 hours and gradually diminishes, changing its periodicity, over the several hours. The phenomenon is repeated to a lessor degree in Figure 133.

This type of propagation should have no unusual effect to any of the frequency diversity modems. The results of the tests not shown were typically the same as the tests that are shown.

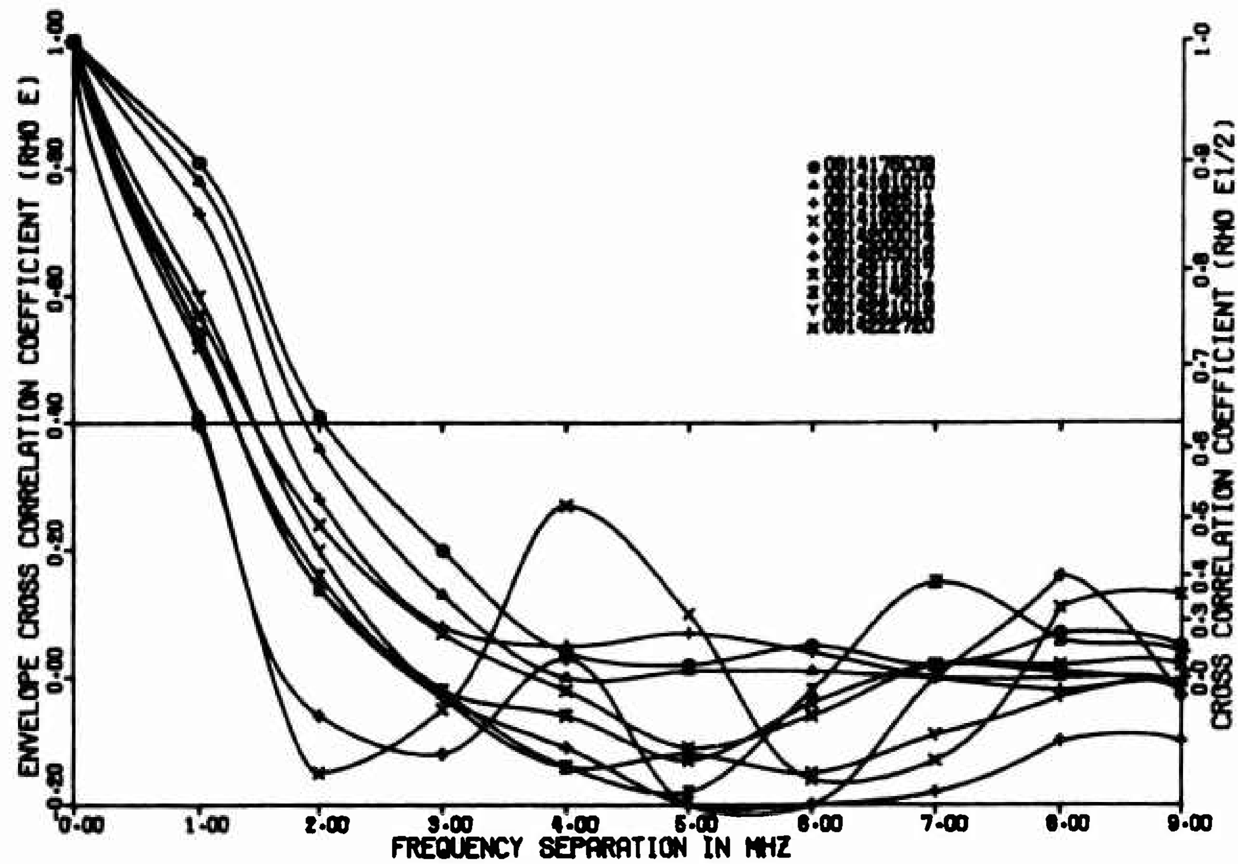


Figure 132. Envelope Cross Correlation Coefficients
Ontario Center, Summer; X-Band, Wide; Temperature Over 85°F

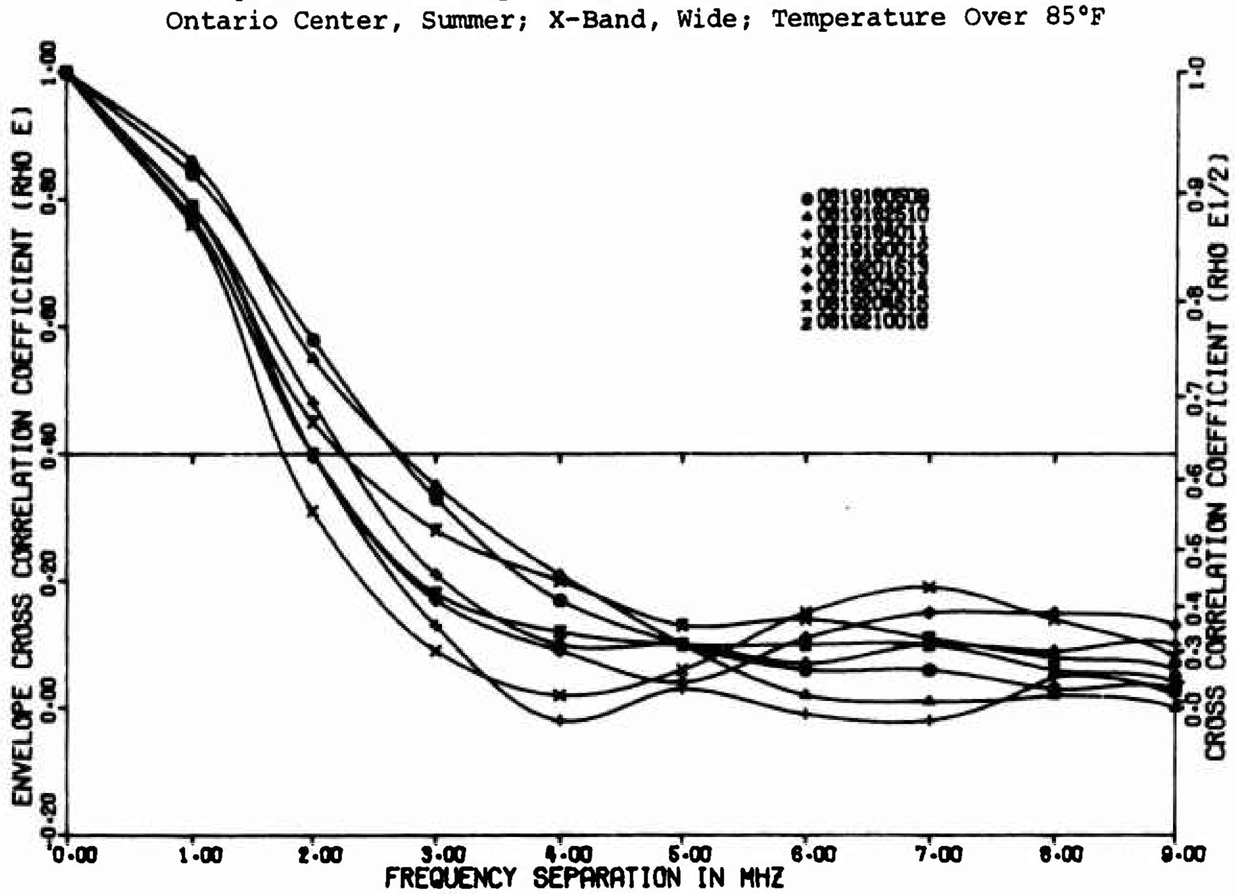


Figure 133. Envelope Cross Correlation Coefficients
Ontario Center, Summer; C-Band, Wide

4. High Fade Rates

Occasionally high fade rates are encountered that could have some effect on adaptive frequency modems. Figures 134 and 135 are examples of some of the very high fade rates. These high fade rates render the best frequency select circuits to be at times spoofed and cause the adapti frequency modem to go to a less than best frequency. Sometimes this can cause an error in the received frequency commands and can cause the link to become broken. The frequency-time modems can operate in the high fade rates without difficulty.

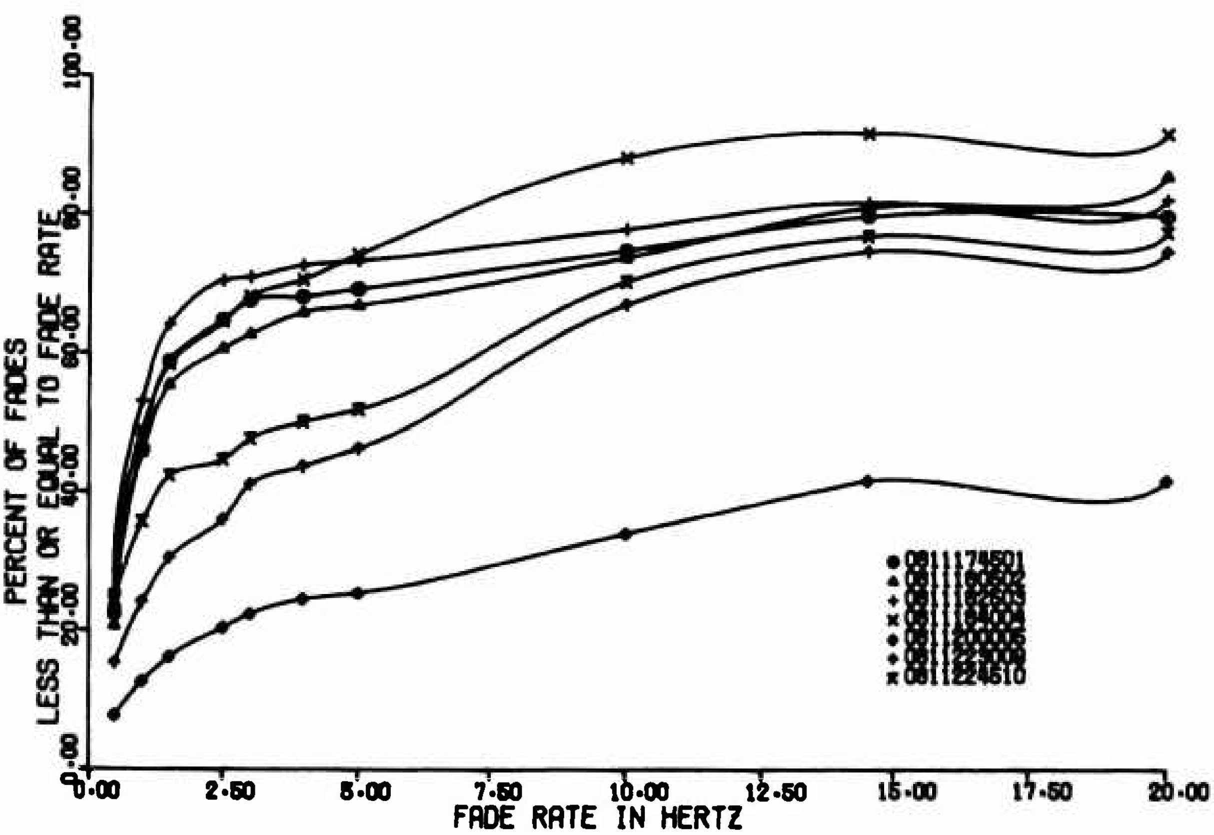


Figure 134. Fade Rate Distribution
Ontario Center, Summer; C-Band

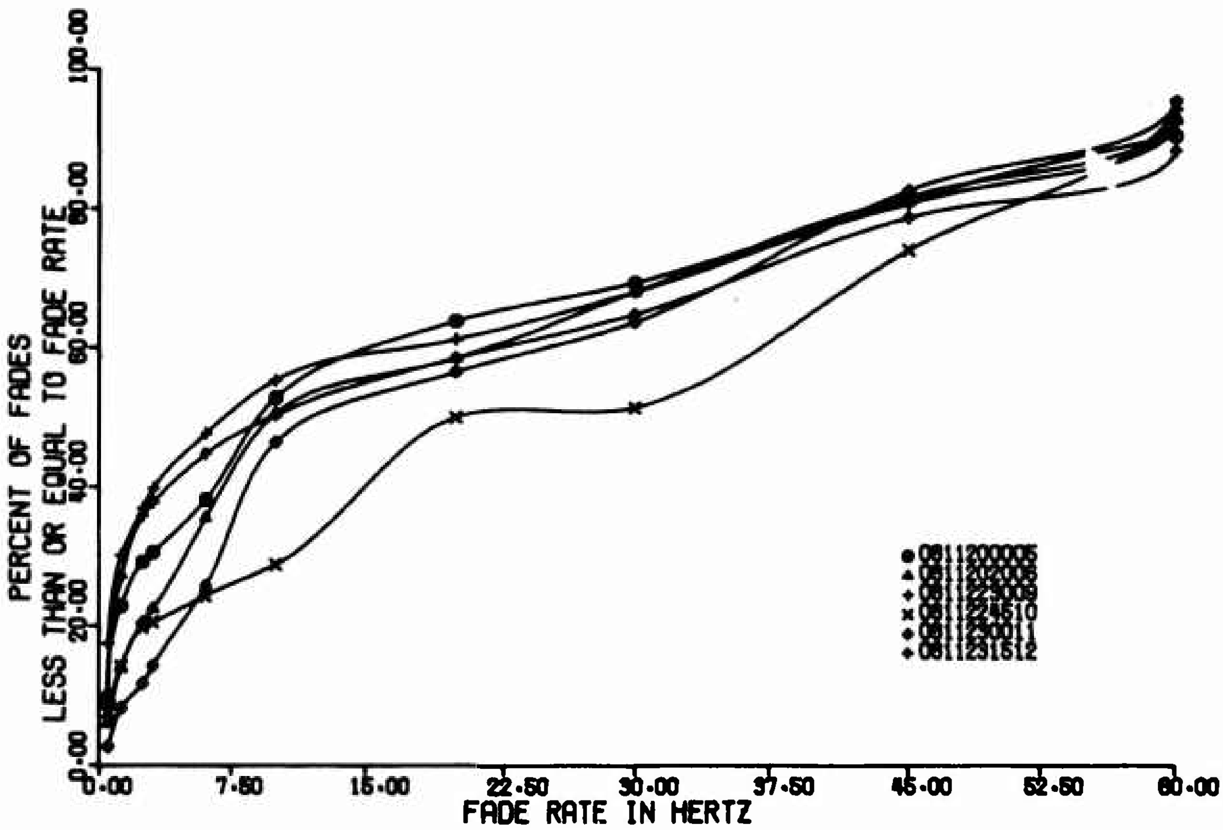


Figure 135. Fade Rate Distribution
Ontario Center, Summer; X-Band

APPENDIX A

CORRELATION BANDWIDTH COMPUTER PROGRAM

APPENDIX A
CORRELATION BANDWIDTH COMPUTER PROGRAM

A computer program was developed which provides correlation bandwidth solutions for a troposcatter link as a function of antenna beamwidths, distance between sites and meteorological conditions in the vicinity of the common volume, i.e., temperature, humidity, and pressure. The geometry for the correlation bandwidth computer program is shown in Figure 136 for reference.

A program flow chart is shown in Figure 137. As can be seen in that figure, the meteorological conditions are used to solve for the surface refractive index constant, Ns. An exponential model for refractive index versus altitude is assumed for purposes of computing ray bending due to refraction. Based on path geometry, calculated Ns, and antenna beamwidth, ray trace solutions for the upper and lower antenna beam ray edges are then obtained such that the multipath spread Δ in microseconds can be obtained. Although the present form of the computer program assumes equal transmitting and receiving antenna beamwidths and zero initial takeoff angle (lower edge of antenna beam on horizon), a more sophisticated version of this program is being developed which will treat the case of nonzero takeoff angles which may be different at the two sites. However, for purposes of analysis of the current experimental data, the form of the computer program as presented is adequate.

Once Δ , the multipath spread is computed, the computer program employs the gaussian (Rice derived) model for the correlation bandwidth for computation of numerical values of the envelope correlation function versus frequency separation in MHz. As can be seen in the flow diagram, a scale factor SF is incorporated within the correlation bandwidth model to account for condition of the troposphere which may vary throughout a given day. That is, the air within the common volume may be turbulent or may exist in layers in which case SF must be altered in accordance.

A listing of the actual computer program is shown on the following pages for reference. Written in standard Fortran IV, the program was executed on the Martin Marietta CDC 6400 computer facility. Very minor modifications, mainly in formatting, will permit execution of the program on other machines such as the IBM 360 or IBM 1130. To demonstrate the operation of the computer code, several test conditions were programmed. The first is the X-band wide Whitford data taken on 29 August at 1450 and 1535 hours, respectively. The other is C-band wide Whitford data also taken on 29 August at 1450 and 1550 hours. These are both shown on the following pages.

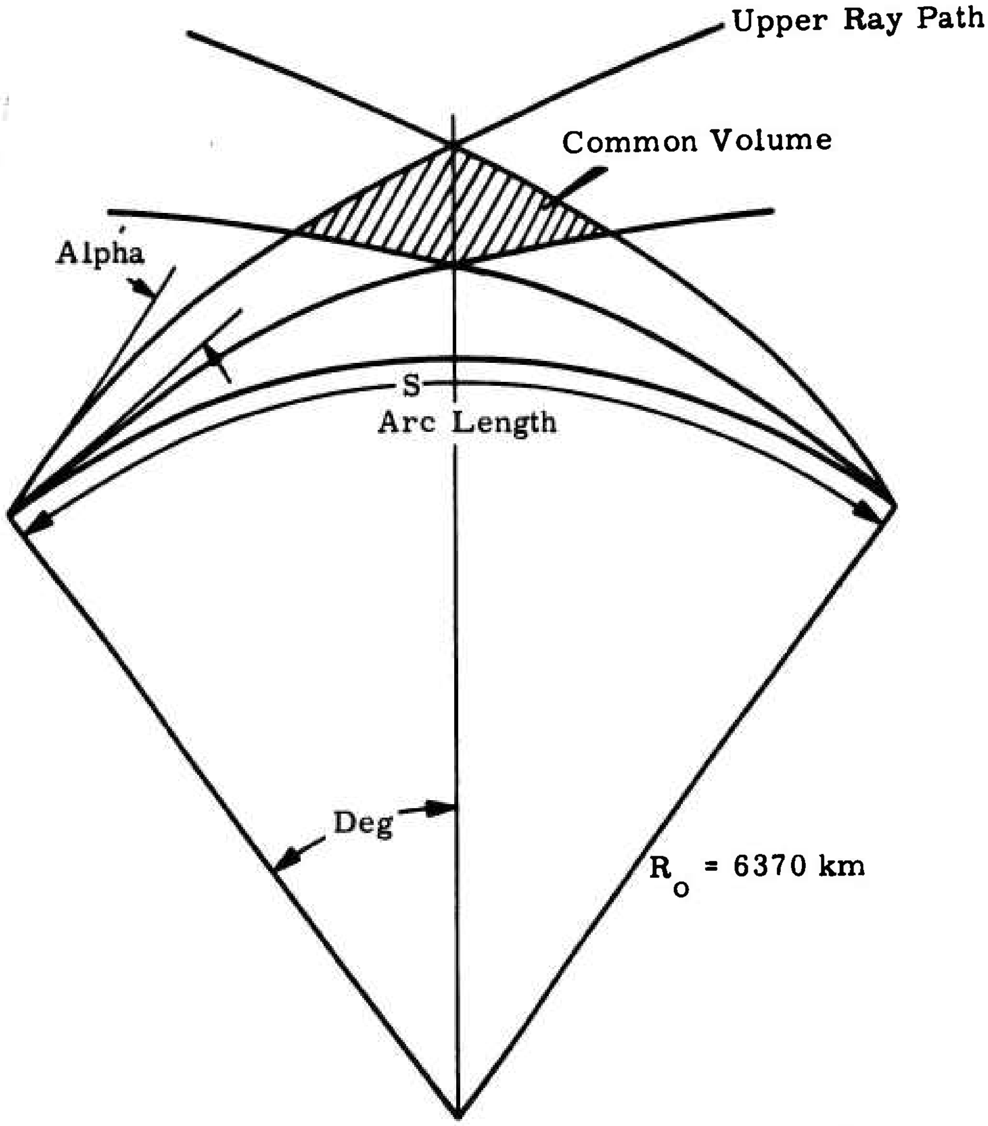
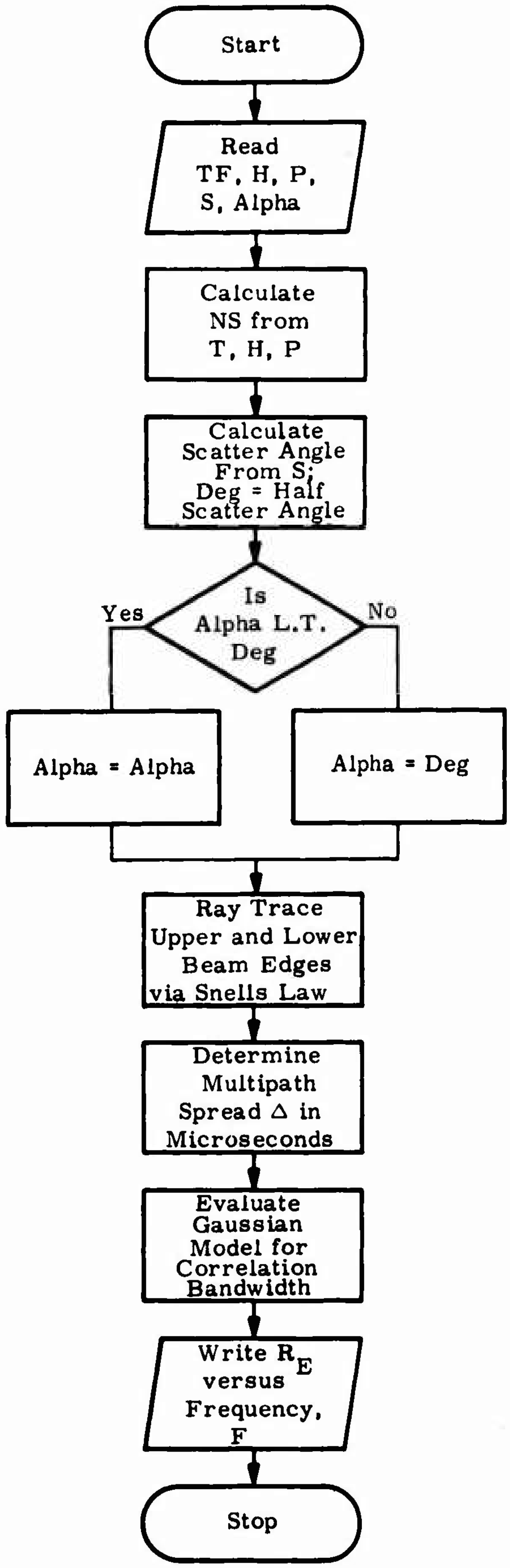


Figure 136. Geometry Applicable to Correlation Bandwidth Computer Program



Inputs

IF = Temperature in Degrees F
H = Humidity in Percent
P = Atmospheric Pressure in Inches Mercury
S = Distance Between Sites in Kilometers
Alpha = Antenna Half Power Beamwidth
SF = Scale Factor Related to Condition of the Troposphere

Output

R_E = Envelope Correlation Function
F = Frequency Separation in MHz

Figure 137. Computer Flow Diagram for Correlation Bandwidth Computation

```
               PROGRAMRAY(INPUT,TAPE 5=INPUT,OUTPUT,TAPE 6=OUTPUT)
000003         DIMENSION RU(1010),RL(1010),RE(101),TEST(2)
          C  PREDICTION OF CORRELATION BANDWIDTH BASED
          C  ON LINK PARAMETERS,WEATHER AND TROPOSPHERE CONDITION
000003         REAL K1,K2,K3,K4,P,PM,PW,N,NS
000003    300  READ(5,250)TEST,TF,H,P,S,SF
000023    250  FORMAT(A6,A6,3X,F10.2,3X,F10.2,3X,F10.3,3X,F8.3,3X,F8.3)
000023         RU(1)=6370.
000024         RL(1)=6370.
          C  S=DISTANCE BETWEEN SITES IN KILOMETERS
000025         D=S/2.
000027         DEG=D/6370.
          C  EFFECTIVE ANTENNA BW ACCORDING TO GORDON
          C  ALPHA=HALF SCATTER ANGLE=DEG
000031         ALPHA=DEG
          C  PROGRAM ASSUMES ANTENNA BW IS E.T. OR G.T. DEG
          C  IF BW IS L.T. DEG THEN LET ALPHA=BW
          C  TF=TEMPERATURE IN DEGREES FAHRENHEIT
          C  CONVERT TO DEGREES CENTIGRADE, TC
000032         TC=(5./9.)*(TF-32.)
          C  P=ATMOSPHERIC PRESSURE IN INCHES MERCURY
          C  CONVERT TO MILLIBARS, PM
000036         PM=P*33.86
          C  H=RELATIVE HUMIDITY IN PERCENT
          C  PW= SATURATED WATER VAPOR PRESSURE IN MILLIBARS
000040         PW=13.2*EXP(0.0391*TC)
          C  COMPUTATION OF NS
000045         K1=77.6
000047         K2=48.1
000050         RAT=PM+((K2*H*PW)/(273.+TC))
000056         NS=(K1*RAT)/(273.+TC)
          C  RAY TRACE LOWER EDGE OF ANTENNA BEAM ON HORIZON
000061         SL=0.
000062         DO 10 K=1,1000
000064         HH=RL(K)-6370.
000066         N=NS*EXP(-0.1057*HH)
000073         DNDR=-0.1057*N
000074         K3=1.+(6370.*DNDR*1.E -6)
000077         AK=K
000101         BSQ=(AK*DEG/1000.)**2
000104         AAA=0.5*K3*BSQ
000106         RL(K+1)=6370.*EXP(AAA)
000113         X=RL(K+1)-RL(K)
000114         Y=(RL(K)*DEG)/1000.
000117         DS=SQRT((X**2)+(Y**2))
000124         SL=SL+DS
000126     10  CONTINUE
```

```
        C  RAY TRACE UPPER EFFECTIVE EDGE OF ANTENNA BEAM
000131        SU=0.
000132        DO 20 I=1,1000
000133        HH=RU(I)-6370.
000135        N=NS*EXP(-0.1057*HH)
000142        DNDR=-0.1057*N
000143        K3=1.+(6370.*DNDR*1.E -6)
000146        AI=I
000150        BSQ=(AI*DEG/1000.)**2
000153        K4=ALPHA+AI*DEG/1000.
000156        BBB=K4+(0.5*K3*BSQ)
000161        RU(I+1)=6370.*EXP(BBB)
000166        X=RU(I+1)-RU(I)
000167        Y=(RU(I)*DEG)/1000.
000172        DS=SQRT((X**2)+(Y**2))
000177        SU=SU+DS
000201  20    CONTINUE
        C  DETERMINE MULTIPATH SPREAD, DELTA IN SECONDS
000204        DELTA=(SU-SL)/(3.E +5)
        C  SF IS A SCALE FACTOR WHICH IS RELATED TO STABILITY OF THE TROPOSPHERE
        C  RICE MODEL FOR CORRELATION BANDWIDTH (GAUSSIAN MODEL)
000206        RE(1)=1.
000210        DO 30 J=2,11
000212        Z=(J-1)*1.E +6
000215        RE(J)=EXP(-((SF*Z*DELTA)**2))
000224  30    CONTINUE
000226        WRITE(6,40)
000231  40    FORMAT(1H1,10X,67HPREDICTION OF ENVELOPE CORRELATION FUNCTION FOR
             1A TROPOSCATTER PATH//)
000231        WRITE(6,100)PM,S
000241  100   FORMAT(1H ,10X,26HPRESSURE IN MILLIBARS,PM= ,F10.2,10X,32HDISTANCE
             1 BETWEEN SITES IN KM,S= ,F12.5//)
000241        WRITE(6,90)TC,H,SF
000253  90    FORMAT(1H ,10X,3HTC=,F6.2,10X,22HHUMIDITY IN PERCENT,H=,F6.2,10X,3
             1HSF=,F8.3//)
000253        WRITE(6,50)NS,ALPHA,TEST
000265  50    FORMAT(1H ,10X,3HNS=,F7.1,10X,6HALPHA=,F10.6,10X,8HTEST NO.,A6,A6/
             1/)
000265        AA=2.*SU
000267        AB=2.*SL
000270        AC=DELTA*1.E +6
000273        WRITE(6,125)AA,AB
000302  125   FORMAT(1H ,10X,24HUPPER RAY LENGTH IN KM.=,F10.4,10X,24HLOWER RAY
             1LENGTH IN KM.=,F10.4//)
```

```
000302          WRITE(6,150)AC
000310   150    FORMAT(1H ,10X,30HMULTIPATH SPREAD IN MICROSEC.=,F10.5//)
000310          WRITE(6,60)
000314   60     FORMAT(1H ,10X,25HFREQUENCY SEPARATION MHZ.,10X,42HENVELOPE FREQUE
               1NCY CORRELATION FUNCTION,RE//)
000314          DO 70 I=1,11
000316          J=I-1
000320          WRITE(6,80)J,RE(I)
000327   80     FORMAT(1H ,20X,I2,30X,F10.6//)
000327   70     CONTINUE
000331          GO TO 300
000332          END
```

PREDICTION OF ENVELOPE CORRELATION FUNCTION FOR A TROPOSCATTER PATH

PRESSURE IN MILLIBARS,PM= 1010.04 DISTANCE BETWEEN SITES IN KM,S= 199.10000

TC= 29.58 HUMIDITY IN PERCENT,H= 49.50 SF= 3.336

NS= 343.7 ALPHA= .015628 TEST NO.08291450XWWH

UPPER RAY LENGTH IN KM.= 199.1804 LOWER RAY LENGTH IN KM.= 199.1113

MULTIPATH SPREAD IN MICROSEC.= .23050

FREQUENCY SEPARATION MHZ.	ENVELOPE FREQUENCY CORRELATION FUNCTION,RE
0	1.000000
1	.553604
2	.093928
3	.004884
4	.000078
5	.000000
6	.000000
7	.000000
8	.000000
9	.000000
10	.000000

PREDICTION OF ENVELOPE CORRELATION FUNCTION FOR A TROPOSCATTER PATH

PRESSURE IN MILLIBARS,PM= 1010.04 DISTANCE BETWEEN SITES IN KM,S= 199.10000

TC= 28.47 HUMIDITY IN PERCENT,H= 49.50 SF= 1.446

NS= 341.7 ALPHA= .015628 TEST NO.08291535XWWH

UPPER RAY LENGTH IN KM.= 199.1805 LOWER RAY LENGTH IN KM.= 199.1113

MULTIPATH SPREAD IN MICROSEC.= .23058

FREQUENCY SEPARATION MHZ.	ENVELOPE FREQUENCY CORRELATION FUNCTION,RE
0	1.000000
1	.894786
2	.641027
3	.367682
4	.168852
5	.062084
6	.018276
7	.004308
8	.000813
9	.000123
10	.000015

PREDICTION OF ENVELOPE CORRELATION FUNCTION FOR A TROPOSCATTER PATH

PRESSURE IN MILLIBARS,PM= 1010.04 DISTANCE BETWEEN SITES IN KM,S= 199.10000

TC= 29.58 HUMIDITY IN PERCENT,H= 49.50 SF= 3.615

NS= 343.7 ALPHA= .015628 TEST NO.08291450CWWH

UPPER RAY LENGTH IN KM.= 199.1804 LOWER RAY LENGTH IN KM.= 199.1113

MULTIPATH SPREAD IN MICROSEC.= .23050

FREQUENCY SEPARATION MHZ.	ENVELOPE FREQUENCY CORRELATION FUNCTION,RE
0	1.000000
1	.499400
2	.062201
3	.001932
4	.000015
5	.000000
6	.000000
7	.000000
8	.000000
9	.000000
10	.000000

```
PREDICTION OF ENVELOPE CORRELATION FUNCTION FOR A TROPOSCATTER PATH

PRESSURE IN MILLIBARS,PM=    1010.04          DISTANCE BETWEEN SITES IN KM,S=    199.10000

TC= 28.47          HUMIDITY IN PERCENT,H= 49.50          SF=   1.606

NS= 341.7          ALPHA=    .015628          TEST NO.08291550CWWH

UPPER RAY LENGTH IN KM.=  199.1805          LOWER RAY LENGTH IN KM.=  199.1113

MULTIPATH SPREAD IN MICROSEC.=    .23058

FREQUENCY SEPARATION MHZ.          ENVELOPE FREQUENCY CORRELATION FUNCTION.RE
```

FREQUENCY SEPARATION MHZ.	ENVELOPE FREQUENCY CORRELATION FUNCTION.RE
0	1.000000
1	.871853
2	.577795
3	.291065
4	.111454
5	.032440
6	.007177
7	.001207
8	.000154
9	.000015
10	.000001

APPENDIX B

TEST RECORDS

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ONTARIO CENTER, SUMMER X-BAND

TEST	RECEIVE SITE WEATHER	RECEIVE SITE TEMP	RECEIVE SITE REL HUM	RECEIVE SITE BARO PRES	RECEIVE SITE WIND	TRANSMIT SITE WEATHER	TRANSMIT SITE TEMP	TRANSMIT SITE REL HUM	TRANSMIT SITE BARO PRES	TRANSMIT SITE WIND	SIGNAL STRG
0805102001WX	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	76.3
0805110002WX	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	76.4
0805141003WX	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	84.0
0805150005WX	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	86.5
0805153506WX	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	91.5
0805171507WX	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	87.3
0805174008WX	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	86.8
0805181009WX	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	88.7
0806123001WX	HAZY	78 TO 81	77	30. 2	15	HAZY	74 TO 77	58	29.39	10	73.5
0806130002WX	HAZY	78 TO 81	77	30. 2	15	HAZY	74 TO 77	58	29.39	10	76.9
0806135004WX	HAZY	78 TO 81	77	30. 2	15	HAZY	74 TO 77	58	29.39	10	79.7
0806160006WX	HAZY	82 TO 85	60	29.99	13	HAZY	78 TO 81	56	29.36	13	82.8
0806162507WX	HAZY	82 TO 85	60	29.99	13	HAZY	78 TO 81	56	29.36	13	81.6
0806165008WX	HAZY	82 TO 85	60	29.99	13	HAZY	78 TO 81	56	29.36	13	81.0
0807093001WX	HAZY	74 TO 77	76	29.42	25	HAZY	70 TO 73	77	29.34	17	90.8
0807095502WX	HAZY	74 TO 77	76	29.42	25	HAZY	70 TO 73	77	29.34	17	89.1
0807101503WX	HAZY	74 TO 77	76	29.42	25	HAZY	70 TO 73	77	29.34	17	84.1
0807104004WX	HAZY	74 TO 77	76	29.42	25	HAZY	70 TO 73	77	29.34	17	81.7
0807153005WX	HAZY	86 TO 88	44	29.88	34	HEAVY HAZE	82 TO 85	47	29.23	22	87.0
0807160006WX	HAZY	86 TO 88	44	29.88	34	HEAVY HAZE	82 TO 85	47	29.23	22	81.3
0807163007WX	HAZY	86 TO 88	44	29.88	34	HEAVY HAZE	82 TO 85	47	29.23	22	78.5
0807184008WX	HAZY	82 TO 85	44	29.89	34	HAZY	82 TO 85	47	29.23	22	79.4
0807185509WX	HAZY	82 TO 85	57	29.84	25	HAZY	82 TO 85	49	29.80	19	79.7
0807191010WX	HAZY	82 TO 85	57	29.84	25	HAZY	82 TO 85	49	29.80	19	80.4
0807192611WX	HAZY	82 TO 85	57	29.84	25	HAZY	82 TO 85	49	29.80	19	80.7
0807203012WX	HAZY	82 TO 85	57	29.84	25	HAZY	82 TO 85	49	29.80	19	87.8
0807205013WX	HAZY	82 TO 85	57	29.84	25	HAZY	82 TO 85	49	29.80	19	89.1
0807211715WX	HAZY	82 TO 85	57	29.84	25	HAZY	82 TO 85	49	29.83	19	83.3
0807215017WX	HAZY	82 TO 85	57	29.84	25	HAZY	82 TO 85	49	29.80	19	83.0
0811200005WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	77.8
0811202006WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	74.9
0811203507WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	60.2
0811205508WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	55.4
0811223009WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	78.7
0811224510WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	75.5
0811230011WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	69.3
0811231512WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	81.0
0812113001WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	[illegible].97	7	74.1
0812114502WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	73.4
0812120003WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	71.9
0812121504WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	68.7
0812141005WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	77.2
0812142506WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	77.4

0812144007WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	78.2
0812150608WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	76.2
0812152509WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	72.8
0812154010WX	RAIN, CUM CLOUD	74 TO 77	47	29.44	7	RAIN, CUM CLOUD	78 TO 81	47	29.97	7	74.2
0813095001WX	CLEAR	70 TO 73	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	75.7
0813101002WX	CLEAR	70 TO 73	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	72.2
0813103003WX	CLEAR	70 TO 73	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	69.2
0813105004WX	CLEAR	70 TO 73	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	68.3
0813111505WX	CLEAR	74 TO 77	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	73.0
0813113006WX	CLEAR	74 TO 77	76	29.48	10	LIGHT HAZE	78 TO 81	66	30.14	8	75.6
0813114507WX	CLEAR	74 TO 77	68	30.14	10	LIGHT HAZE	78 TO 81	51	29.48	9	75.7
0813120008WX	CLEAR	74 TO 77	68	30.14	10	LIGHT HAZE	78 TO 81	51	29.48	39	75.4
0814150601WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	76.0
0814152002WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	77.6
0814154503WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	77.5
0814155904WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	79.3
0814155904WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	79.3
0814161505WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	79.3
0814164506WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	80.6
0814170007WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	81.9
0814171508WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	82.6
0814175009WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	82.4
0814181010WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	84.0
0814182511WX	LIGHT HAZE	86 TO 88	36	29.48	15	LIGHT HAZE	86 TO 88	41	30. 4	15	83.9
0814193012WX	LIGHT HAZE	86 TO 88	45	30. 4	19	LIGHT HAZE	86 TO 88	43	30. 0	15	82.9
0814194513WX	LIGHT HAZE	86 TO 88	45	30. 4	19	LIGHT HAZE	86 TO 88	43	30. 0	15	78.8
0814200014WX	LIGHT HAZE	86 TO 88	45	30. 4	19	LIGHT HAZE	86 TO 88	43	30. 0	15	83.0
0814201515WX	LIGHT HAZE	86 TO 88	45	30. 4	19	LIGHT HAZE	86 TO 88	43	30. 0	15	84.2
0814203016WX	LIGHT HAZE	86 TO 88	45	30. 4	19	LIGHT HAZE	86 TO 88	43	30. 0	15	83.0
0814211517WX	LIGHT HAZE	70 TO 73	68	30. 7	15	CUMULUS CLOUDING	78 TO 81	46	30. 5	15	86.8
0814214518WX	LIGHT HAZE	70 TO 73	68	30. 7	15	CUMULUS CLOUDING	78 TO 81	46	30. 5	15	83.2
0814221019WX	LIGHT HAZE	70 TO 73	68	30. 7	15	CUMULUS CLOUDING	78 TO 81	46	30. 5	15	84.3
0814222720WX	LIGHT HAZE	70 TO 73	68	30. 7	15	CUMULUS CLOUDING	78 TO 81	46	30. 5	15	89.5
0819180509NX	CLEAR	74 TO 77	47	29.85	16	CLEAR	78 TO 81	40	29.21	16	87.7
0819182510NX	CLEAR	74 TO 77	47	29.85	16	CLEAR	78 TO 81	40	29.21	16	88.9
0819184011NX	CLEAR	74 TO 77	47	29.85	16	CLEAR	78 TO 81	40	29.21	16	89.3
0819190012NX	CLEAR	74 TO 77	45	29.86	20	CLEAR	78 TO 81	79	29.84	14	88.9
0819203014NX	CLEAR	70 TO 73	45	29.86	20	CLEAR	70 TO 73	79	29.84	14	90.5
0819204515NX	CLEAR	70 TO 73	45	29.86	20	CLEAR	70 TO 73	79	29.84	14	89.4
0819210016NX	CLEAR	70 TO 73	45	29.86	20	CLEAR	70 TO 73	79	29.84	14	88.7
0820100001WX	CLEAR	62 TO 65	56	30. 7	17	CLEAR	62 TO 65	36	29.87	17	75.7
0820102502WX	CLEAR	62 TO 65	56	30. 7	17	CLEAR	62 TO 65	36	29.87	17	75.9
0820104503WX	CLEAR	62 TO 65	56	30. 7	17	CLEAR	62 TO 65	36	29.87	17	77.6
0820110004WX	CLEAR	62 TO 65	56	30. 7	17	CLEAR	62 TO 65	36	.87	17	77.5
0820120005WX	CLEAR	62 TO 65	56	30. 7	17	CLEAR	62 TO 65	36	29.87	17	72.0
0820122006WX	CLEAR	62 TO 65	56	30. 7	17	CLEAR	62 TO 65	36	29.87	17	69.8
0820123507WX	CLEAR	62 TO 65	56	30. 7	17	CLEAR	62 TO 65	36	29.87	17	70.5
0820125508WX	CLEAR	62 TO 65	56	30. 7	17	CLEAR	62 TO 65	36	29.87	17	69.9

ONTARIO CENTER, SUMMER C-BAND

TEST	WEATHER	RECEIVE SITE TEMP	REL HUM	BARO PRES	WIND	WEATHER	TRANSMIT SITE TEMP	REL HUM	BARO PRES	WIND	SIGNAL STRG
0805144004WC	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	77.2
0805150005WC	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	77.4
0805153506WC	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	75.9
0805171507WC	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	77.1
0805174008WC	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	77.6
0805181009WC	HAZY	78 TO 81	51	29.99	9	STRATUS CLOUDING	82 TO 85	51	29.99	10	79.8
0806123001WC	HAZY	78 TO 81	77	30. 2	15	HAZY	74 TO 77	58	29.39	10	72.9
0806130002WC	HAZY	78 TO 81	77	30. 2	15	HAZY	74 TO 77	58	29.39	10	74.5
0806132503WC	HAZY	78 TO 81	77	30. 2	15	HAZY	74 TO 77	58	29.39	10	75.4
0806135004WC	HAZY	78 TO 81	77	30. 2	15	HAZY	74 TO 77	58	29.39	10	75.2
0806160006WC	HAZY	82 TO 85	60	29.99	13	HAZY	78 TO 81	56	29.36	13	79.1
0806162507WC	HAZY	82 TO 85	60	29.99	13	HAZY	78 TO 81	56	29.36	13	79.1
0806165008WC	HAZY	82 TO 85	60	29.99	13	HAZY	78 TO 81	56	29.36	13	77.5
0807153005WC	HAZY	86 TO 88	44	29.88	34	HEAVY HAZE	82 TO 85	47	29.23	22	78.3
0811174501WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	74 TO 77	40	29.97	7	80.2
0811180502WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	74 TO 77	47	29.97	7	81.9
0811182503WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	74 TO 77	47	29.97	7	82.1
0811184004WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	74 TO 77	47	29.97	7	79.4
0811200005WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	78 TO 81	47	29.97	7	76.7
0811223009WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	78 TO 81	47	29.97	7	75.4
0811224510WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	78 TO 81	47	29.97	7	77.4
0811230011WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	78 TO 81	47	29.97	7	66.1
0812114502WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	78 TO 81	47	29.97	7	71.[illegible]
0812121504WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	78 TO 81	47	29.97	7	69.6
0812154010WC	CUMULUS CLOUDING	74 TO 77	47	29.44	7	CUMULUS CLOUDING	78 TO 81	47	29.97	7	70.8
0813095001WC	CLEAR	70 TO 73	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	71.5
0813101002WC	CLEAR	70 TO 73	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	67.8
0813103003WC	CLEAR	70 TO 73	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	66.4
0813105004WC	CLEAR	70 TO 73	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	66.7
0813111505WC	CLEAR	74 TO 77	76	29.48	10	LIGHT FOG	70 TO 73	66	30.14	8	71.5
0813113006WC	CLEAR	74 TO 77	76	29.48	10	HAZY	78 TO 81	66	30.14	8	72.3
0813114507WC	CLEAR	74 TO 77	68	30.14	10	HAZY	78 TO 81	51	29.48	9	66.2
0813120008WC	CLEAR	74 TO 77	68	30.14	10	HAZY	78 TO 81	51	29.48	9	71.3
0819135503WC	CLEAR	74 TO 77	47	29.85	16	CLEAR	78 TO 81	40	29.21	16	72.8
0819145505WC	CLEAR	74 TO 77	47	29.85	16	CLEAR	78 TO 81	40	29.21	16	74.9
0819151506WC	CLEAR	74 TO 77	47	29.85	16	CLEAR	78 TO 81	40	29.21	16	75.8
0819154007WC	CLEAR	74 TO 77	47	29.85	16	CLEAR	78 TO 81	40	29.21	16	77.9
0819155508WC	CLEAR	74 TO 77	47	29.85	16	CLEAR	78 TO 81	40	29.21	16	78.3
0819180509WC	CLEAR	74 TO 77	47	29.86	20	CLEAR	78 TO 81	40	29.21	16	82.0
0819182510WC	CLEAR	74 TO 77	47	29.86	20	CLEAR	78 TO 81	40	29.21	16	82.5
0819184011WC	CLEAR	74 TO 77	47	29.86	20	CLEAR	78 TO 81	40	2[illegible].21	16	81.9
0819190012WC	CLEAR	74 TO 77	45	29.86	20	CLEAR	78 TO 81	79	[illegible].84	14	81.4
0819201513WC	CLEAR	70 TO 73	45	29.86	20	CLEAR	70 TO 73	79	29.84	14	82.0
0819203014WC	CLEAR	70 TO 73	45	29.86	20	CLEAR	70 TO 73	79	29.84	14	82.5
0819204515WC	CLEAR	70 TO 73	45	29.86	20	CLEAR	70 TO 73	79	29.84	14	82.7
0819210016WC	CLEAR	70 TO 73	45	29.86	20	CLEAR	70 TO 73	79	29.84	14	83.4

WHITFORD FIELD, SUMMER X-BAND

TEST	RECEIVE SITE WEATHER	RECEIVE SITE TEMP	RECEIVE SITE REL HUM	RECEIVE SITE BARO PRES	RECEIVE SITE WIND	TRANSMIT SITE WEATHER	TRANSMIT SITE TEMP	TRANSMIT SITE REL HUM	TRANSMIT SITE BARO PRES	TRANSMIT SITE WIND	SIGNAL STRG
0828165501WX	CLEAR	86 TO 88	36	30.21	10	CLEAR	86 TO 88	53	29.52	17	98.1
0828172502WX	CLEAR	86 TO 88	36	30.21	10	CLEAR	86 TO 88	53	29.52	17	100.9
0828174503WX	CLEAR	86 TO 88	36	30.21	10	CLEAR	86 TO 88	53	29.52	17	105.5
0828182004WX	CLEAR	86 TO 88	36	30.21	10	CLEAR	86 TO 88	53	29.52	17	103.9
0828184005WX	LIGHT HAZE	82 TO 85	42	30.17	27	LIGHT HAZE	82 TO 85	41	30.12	27	106.1
0828194006NX	LIGHT HAZE	82 TO 85	42	30.17	27	LIGHT HAZE	82 TO 85	41	30.12	27	120.5
0828195507NX	LIGHT HAZE	82 TO 85	42	30.17	27	LIGHT HAZE	82 TO 85	41	30.12	27	120.2
0829083501NX	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	114.3
0829085002NX	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	115.4
0829090703NX	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	116.7
0829092504NX	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	117.0
0829094005NX	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	118.4
0829102506NX	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	116.5
0829111008NX	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	116.7
0829120509WX	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	100.5
0829123010WX	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	97.1
0829125511WX	LIGHT HAZE	82 TO 85	57	30.18	15	LIGHT HAZE	82 TO 85	72	29.52	14	98.7
0829131512WX	LIGHT HAZE	82 TO 85	43	30.18	14	LIGHT HAZE	82 TO 85	61	29.52	14	100.9
0829133513WX	LIGHT HAZE	82 TO 85	43	30.18	14	LIGHT HAZE	82 TO 85	61	29.52	14	102.3
0829145014WX	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	82 TO 85	55	29.49	11	92.7
0829150515WX	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	82 TO 85	55	29.49	11	94.4
0829152016WX	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	82 TO 85	55	29.49	11	92.6
0829153517WX	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	82 TO 85	55	29.49	11	90.7
0829155018WX	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	82 TO 85	55	29.49	11	92.8
0905114501NX	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	118.8
0905120102NX	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	117.3
0905121703NX	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	116.9
0905134004NX	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	106.7
0905135505NX	LIGHT HAZE	74 TO 77	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	107.8
0905141006NX	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	105.1
0905144508NX	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	107.2
0905153509NX	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	110.1
0905155510NX	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	106.9
0905161011NX	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	114.6
0905163012NX	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	117.3
0908105501WX	CUMULUS CLOUDING	66 TO 69	67	29.29	15	CLEAR	66 TO 69	68	29.27	13	103.1
0908112503WX	CUMULUS CLOUDING	66 TO 69	67	29.29	15	CLEAR	66 TO 69	68	29.27	13	104.2
0908131505WX	CUMULUS CLOUDING	66 TO 69	73	29. 8	7	CLEAR	66 TO 69	73	29.92	12	98.5
0908141008WX	CUMULUS CLOUDING	66 TO 69	73	29. 8	7	CLEAR	66 TO 69	73	.92	12	94.5
0908171511WX	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	102.9
0908175013WX	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	100.0
0908194017WX	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	96.5

WHITFORD FIELD, SUMMER C-BAND

TEST	RECEIVE SITE WEATHER	RECEIVE SITE TEMP	RECEIVE SITE REL HUM	RECEIVE SITE BARO PRES	RECEIVE SITE WIND	TRANSMIT SITE WEATHER	TRANSMIT SITE TEMP	TRANSMIT SITE REL HUM	TRANSMIT SITE BARO PRES	TRANSMIT SITE WIND	SIGNAL STRG
0828165501NC	CLEAR	86 TO 88	36	30.21	10	CLEAR	86 TO 88	53	29.52	17	109.8
0828172502NC	CLEAR	86 TO 88	36	30.21	10	CLEAR	86 TO 88	53	29.52	17	112.7
0828174503NC	CLEAR	86 TO 88	36	30.21	10	CLEAR	86 TO 88	53	29.52	17	116.8
0828182004NC	CLEAR	86 TO 88	36	30.21	10	CLEAR	86 TO 88	53	29.52	17	117.7
0828184005NC	LIGHT HAZE	82 TO 85	42	30.17	27	LIGHT HAZE	82 TO 85	41	30.12	27	118.3
0828194006WC	LIGHT HAZE	82 TO 85	42	30.17	27	LIGHT HAZE	82 TO 85	41	30.12	27	97.1
0828195507WC	LIGHT HAZE	82 TO 85	42	30.17	27	LIGHT HAZE	82 TO 85	41	30.12	27	96.6
0829083501WC	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	96.9
0829085002WC	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	96.7
0829090703WC	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	94.7
0829092504WC	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	91.6
0829094005WC	LIGHT HAZE	70 TO 73	68	30.19	15	LIGHT HAZE	74 TO 77	77	29.52	14	90.4
0829102506WC	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	94.2
0829105007WC	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	93.4
0829111008WC	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	93.4
0829120509NC	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	115.3
0829123010NC	LIGHT HAZE	74 TO 77	57	30.18	15	LIGHT HAZE	78 TO 81	72	29.52	14	115.0
0829125511NC	LIGHT HAZE	82 TO 85	43	30.18	14	LIGHT HAZE	82 TO 85	61	29.52	14	114.1
0829131512NC	LIGHT HAZE	82 TO 85	43	30.18	14	LIGHT HAZE	82 TO 85	61	29.52	14	117.5
0829133513NC	LIGHT HAZE	82 TO 85	43	30.18	14	LIGHT HAZE	82 TO 85	61	29.52	14	115.7
0829145014WC	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	82 TO 85	55	29.49	11	85.0
0829150515WC	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	82 TO 85	55	29.49	11	85.4
0829152016WC	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	82 TO 85	55	29.49	11	84.6
0829153517WC	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	78 TO 81	55	29.49	11	82.2
0829155018WC	LIGHT HAZE	86 TO 88	44	30.17	10	LIGHT HAZE	78 TO 81	55	29.49	11	84.2
0902103002WC	STRATUS CLOUDING	70 TO 73	76	30.19	5	STRATUS CLOUDING	70 TO 73	82	29.50	5	91.2
0902104003WC	STRATUS CLOUDING	70 TO 73	76	30.19	5	STRATUS CLOUDING	70 TO 73	82	29.50	5	92.4
0902105504WC	STRATUS CLOUDING	70 TO 73	76	30.19	5	STRATUS CLOUDING	70 TO 73	82	29.50	5	92.4
0902111005WC	STRATUS CLOUDING	70 TO 73	76	30.19	5	STRATUS CLOUDING	70 TO 73	82	29.50	5	95.3
0902112506WC	STRATUS CLOUDING	70 TO 73	76	30.19	5	STRATUS CLOUDING	70 TO 73	82	29.50	5	94.6
0902122007WC	STRATUS CLOUDING	70 TO 73	76	30.19	5	STRATUS CLOUDING	70 TO 73	82	29.50	5	94.6
0902124008WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	95.4
0902131009WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	95.2
0902134510WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	92.2
0902140011WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	89.6
0902141512WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	90.0
0902143513WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	94.8
0902151014WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	89.3
0902152515WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	92.5
0902154516WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	29.51	5	93.8
0902160117WC	STRATUS CLOUDING	70 TO 73	71	30.20	5	STRATUS CLOUDING	70 TO 73	76	[illegible].51	5	93.0
0903133008NC	CLEAR	78 TO 81	50	30.19	3	CLEAR	78 TO 81	53	29.52	5	112.9
0903142009NC	CLEAR	78 TO 81	50	30.19	3	CLEAR	78 TO 81	53	29.52	5	110.7

0903143510NC	CLEAR	78 TO 81	50	30.19	3	CLEAR	78 TO 81	53	29.52	5	109.9
0903145511NC	CLEAR	78 TO 81	50	30.19	3	CLEAR	78 TO 81	53	29.52	5	107.4
0903151012NC	CLEAR	78 TO 81	50	30.19	3	CLEAR	78 TO 81	53	29.52	5	109.8
0904151503NC	STRATUS CLOUDING	78 TO 81	54	30.21	7	STRATUS CLOUDING	82 TO 85	57	29.54	9	106.6
0904153004NC	STRATUS CLOUDING	78 TO 81	54	30.21	7	STRATUS CLOUDING	82 TO 85	57	29.54	9	111.6
0904155005NC	STRATUS CLOUDING	78 TO 81	54	30.21	7	STRATUS CLOUDING	82 TO 85	57	29.54	9	113.0
0904160006NC	STRATUS CLOUDING	78 TO 81	54	30.21	7	STRATUS CLOUDING	82 TO 85	57	29.54	9	116.8
0904161707NC	STRATUS CLOUDING	78 TO 81	54	30.21	7	STRATUS CLOUDING	82 TO 85	57	29.54	9	116.4
0905114501WC	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	97.6
0905120102WC	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	96.3
0905121703WC	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	95.0
0905134004WC	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	89.5
0905135505WC	LIGHT HAZE	74 TO 77	62	30.19	10	LIGHT HAZE	82 TO 85	63	29.46	14	88.9
0905141006WC	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	86.3
0905142507WC	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	85.8
0905144508WC	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	87.9
0905153509WC	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	92.6
0905155510WC	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	90.2
0905163012WC	CUMULUS CLOUDING	78 TO 81	57	30.14	21	LIGHT HAZE	82 TO 85	67	29.44	15	97.3
0908105501WC	CUMULUS CLOUDING	66 TO 69	67	29.29	15	CLEAR	66 TO 69	68	29.27	13	94.0
0908111002WC	CUMULUS CLOUDING	66 TO 69	67	29.29	15	CLEAR	66 TO 69	68	29.27	13	98.1
0908112503WC	CUMULUS CLOUDING	66 TO 69	67	29.29	15	CLEAR	66 TO 69	68	29.27	13	100.9
0908114004WC	CUMULUS CLOUDING	66 TO 69	67	29.29	15	CLEAR	66 TO 69	68	29.27	13	100.2
0908131505WC	CUMULUS CLOUDING	66 TO 69	73	29. 8	7	CLEAR	66 TO 69	73	29.92	12	95.7
0908134006WC	CUMULUS CLOUDING	66 TO 69	73	29. 8	7	CLEAR	66 TO 69	73	29.92	12	92.6
0908135507WC	CUMULUS CLOUDING	66 TO 69	73	29. 8	7	CLEAR	66 TO 69	73	29.92	12	91.9
0908141008WC	CUMULUS CLOUDING	66 TO 69	73	29. 8	7	CLEAR	66 TO 69	73	29.92	12	91.4
0908150009WC	CUMULUS CLOUDING	66 TO 69	73	29. 8	7	CLEAR	66 TO 69	73	29.92	12	93.3
0908151510WC	CUMULUS CLOUDING	66 TO 69	73	29. 8	7	CLEAR	66 TO 69	73	29.92	12	99.8
0908171511NC	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	118.7
0908173012NC	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	121.0
0908175013NC	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	120.5
0908180214WC	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	100.3
0908181815NC	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	117.8
0908183216WC	CUMULUS CLOUDING	74 TO 77	46	29.84	11	CLEAR	74 TO 77	53	29.86	14	96.5
0908200018WC	CUMULUS CLOUDING	74 TO 77	42	29.84	10	CLEAR	74 TO 77	53	29.86	14	98.3
0908201519NC	CUMULUS CLOUDING	74 TO 77	42	29.84	10	CLEAR	74 TO 77	53	29.86	14	118.2
0909095001NC	CLEAR	62 TO 65	62	29.83	15	CUMULUS CLOUDING	62 TO 65	63	29.21	14	118.5
0909100802WC	CLEAR	62 TO 65	62	29.83	15	CUMULUS CLOUDING	62 TO 65	63	29.21	14	106.4
0909103003NC	CLEAR	62 TO 65	62	29.83	15	CUMULUS CLOUDING	62 TO 65	63	29.21	14	119.7
0909105004WC	CLEAR	62 TO 65	62	29.83	15	CUMULUS CLOUDING	62 TO 65	63	[illegible].21	14	100.4

POINT PETRE, SEPT X-BAND

TEST	RECEIVE SITE WEATHER	TEMP	REL HUM	BARO PRES	WIND	TRANSMIT SITE WEATHER	TEMP	REL HUM	BARO PRES	WIND	SIGNAL STRG
0915203001WX	DARK	66 TO 69	76	29.92	30	DARK	66 TO 69	79	29.92	30	89.2
0915211003WX	DARK	66 TO 69	76	29.92	30	DARK	66 TO 69	79	29.92	30	87.8
0915212604WX	DARK	66 TO 69	76	29.92	30	DARK	66 TO 69	79	29.92	30	87.3
0916110001WX	STRATUS CLOUDING	66 TO 69	85	29.91	25	RAIN, STAT CLOUD	70 TO 73	59	29.95	20	88.3
0916151509WX	STRATUS CLOUDING	66 TO 69	85	29.91	25	STRATUS CLOUDING	78 TO 81	65	29.96	23	87.7
0916153510WX	STRATUS CLOUDING	70 TO 73	73	29.86	30	STRATUS CLOUDING	78 TO 81	65	29.92	20	86.7
0916155511WX	STRATUS CLOUDING	70 TO 73	73	29.86	30	STRATUS CLOUDING	78 TO 81	65	29.92	20	84.9
0916161012WX	STRATUS CLOUDING	70 TO 73	73	29.86	30	STRATUS CLOUDING	78 TO 81	65	29.92	20	84.3
0917094501WX	RAIN, STAT CLOUD	54 TO 57	94	29.93	15	STRATUS CLOUDING	54 TO 57	94	29.93	15	89.9
0917100502WX	RAIN, STAT CLOUD	54 TO 57	94	29.93	15	STRATUS CLOUDING	54 TO 57	94	29.93	15	88.7
0917110203NX	STRATUS CLOUDING	50 TO 53	94	30. 1	15	STRATUS CLOUDING	54 TO 57	94	29.93	15	97.6
0917112004NX	STRATUS CLOUDING	50 TO 53	94	30. 1	15	STRATUS CLOUDING	54 TO 57	94	29.93	15	97.4
0917113505NX	STRATUS CLOUDING	50 TO 53	94	30. 1	15	STRATUS CLOUDING	54 TO 57	94	29.93	15	96.2
0917115606NX	STRATUS CLOUDING	50 TO 53	94	30. 1	15	STRATUS CLOUDING	54 TO 57	94	29.93	15	78.4
0917140407WX	STRATUS CLOUDING	54 TO 57	73	30. 3	15	STRATUS CLOUDING	54 TO 57	81	29.42	6	85.7
0917151009WX	STRATUS CLOUDING	54 TO 57	73	30. 3	15	STRATUS CLOUDING	54 TO 57	81	29.42	6	89.3
0917152510WX	STRATUS CLOUDING	54 TO 57	73	30. 3	15	STRATUS CLOUDING	54 TO 57	81	29.42	6	90.3
0917160012WX	STRATUS CLOUDING	54 TO 57	56	30. 2	15	STRATUS CLOUDING	54 TO 57	83	29.42	6	88.5
0918091501WX	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	88.0
0918093502WX	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	86.5
0918095003WX	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	84.9
0918100504WX	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	83.9
0918110005WX	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	88.1
0918111606WX	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	91.5
0918113507WX	CUMULUS CLOUDING	54 TO 57	69	30.36	15	CUMULUS CLOUDING	54 TO 57	53	29.70	17	94.2
0918115408WX	CUMULUS CLOUDING	54 TO 57	69	30.36	15	CUMULUS CLOUDING	54 TO 57	53	29.70	17	93.6
0918133209WX	CLEAR	58 TO 61	55	30.36	13	CLEAR	66 TO 69	48	29.71	17	90.7
0918135010WX	CLEAR	58 TO 61	55	30.36	13	CLEAR	66 TO 69	48	29.71	17	90.7
0918140611WX	CLEAR	58 TO 61	55	30.36	13	CLEAR	66 TO 69	48	29.71	17	89.2
0918142512WX	CLEAR	58 TO 61	55	30.36	13	CLEAR	66 TO 69	48	29.71	17	93.5
0918153013WX	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	98.0
0918155014WX	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	95.2
0918165015NX	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	112.7
0918170516NX	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	[illegible].71	17	112.3
0918172017NX	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	112.3
0918173518NX	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	110.9
0918175519NX	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	110.6
0918193021WX	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	62 TO 65	40	29.73	15	92.8

0918194522*X	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	62 TO 65	41	29.73	15	92.8
0918205023*X	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	54 TO 57	69	29.73	15	85.4
0918210524*X	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	54 TO 57	69	29.73	15	87.0
0918212025*X	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	54 TO 57	69	29.73	15	88.4
0918214026*X	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	54 TO 57	69	29.73	15	89.4
0923014001*X	CLEAR	46 TO 49	96	30. 2	20	LIGHT FOG	54 TO 57	86	29.38	9	63.3
0923032504*X	CLEAR	46 TO 49	96	30. 2	20	LIGHT FOG	54 TO 57	86	29.38	9	81.0
0923034005*X	LIGHT FOG	46 TO 49	96	29.99	25	LIGHT FOG	54 TO 57	81	29.37	9	73.5
0923035506*X	LIGHT FOG	46 TO 49	96	29.99	25	LIGHT FOG	54 TO 57	81	29.37	9	76.7
0923041007*X	LIGHT FOG	46 TO 49	96	29.99	25	LIGHT FOG	54 TO 57	81	29.37	9	79.8
0923042508*X	LIGHT FOG	46 TO 49	96	29.99	25	LIGHT FOG	54 TO 57	81	29.37	9	77.4
0923051009*X	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	90.3
0923052510*X	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	89.1
0923054511*X	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	86.7
0923060012*X	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	89.3
0923061513*X	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	90.5
0923065514*X	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	89.9
0923071515*X	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	88.7
0923073016*X	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	88.9
0923075017*X	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	87.2
0923080518*X	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	88.7
0923093019*X	CLEAR	50 TO 53	99	29.94	20	HAZY	62 TO 65	58	29.30	12	87.5
0923094520*X	CLEAR	50 TO 53	99	29.94	20	HAZY	62 TO 65	58	29.30	12	87.9
0924101801*X	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	92.8
0924103502*X	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	92.2
0924105003*X	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	92.8
0924110504*X	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	93.7
0924112005*X	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	92.9
0924132506NX	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	108.8
0924134507NX	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	108.1
0924140208*X	CUMULUS CLOUDING	54 TO 57	85	29.74	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	97.8
0924142009*X	CUMULUS CLOUDING	54 TO 57	85	29.74	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	97.4
0924144010*X	CUMULUS CLOUDING	54 TO 57	85	29.74	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	96.7
0924152511*X	CUMULUS CLOUDING	54 TO 57	85	29.74	15	STRATUS CLOUDING	58 TO 61	93	29.14	8	103.3
0924154412*X	CUMULUS CLOUDING	54 TO 57	85	29.74	15	STRATUS CLOUDING	58 TO 61	93	29.14	8	104.1
0924155813*X	CUMULUS CLOUDING	54 TO 57	85	29.74	15	STRATUS CLOUDING	58 TO 61	93	29.14	8	104.8
0924.61214*X	CUMULUS CLOUDING	54 TO 57	85	29.74	15	STRATUS CLOUDING	58 TO 61	93	29.14	8	102.2
0925091001NX	STRATUS CLOUDING	46 TO 49	77	29.95	15	RAIN, CUM CLOUD	50 TO 53	90	29.30	9	113.2
0925093002NX	STRATUS CLOUDING	46 TO 49	77	29.95	15	RAIN, CUM CLOUD	50 TO 53	90	29.30	9	113.9
0925095003*X	STRATUS CLOUDING	46 TO 49	77	29.95	15	RAIN, CUM CLOUD	50 TO 53	90	29.30	9	99.5
0925101004*X	STRATUS CLOUDING	46 TO 49	77	29.95	15	RAIN, CUM CLOUD	50 TO 53	90	29.30	9	99.4
0925110005*X	STRATUS CLOUDING	46 TO 49	93	29.60	13	CUMULUS CLOUDING	54 TO 57	88	[illegible].31	9	99.3
0925111806*X	STRATUS CLOUDING	46 TO 49	93	29.60	13	CUMULUS CLOUDING	54 TO 57	88	[illegible]9.31	9	98.8

0925113507WX	STRATUS CLOUDING	46 TO 49	93	29.60	13	CUMULUS CLOUDING	54 TO 57	88	29.31	9	98.2
0925115008WX	STRATUS CLOUDING	46 TO 49	93	29.60	13	CUMULUS CLOUDING	54 TO 57	88	29.31	9	96.4
0925134509WX	CUMULUS CLOUDING	62 TO 65	65	29.67	9	CUMULUS CLOUDING	54 TO 57	72	29.32	7	96.5
0925140210WX	CUMULUS CLOUDING	62 TO 65	65	29.67	9	CUMULUS CLOUDING	54 TO 57	72	29.32	7	97.2
0925141811WX	CUMULUS CLOUDING	62 TO 65	65	29.67	9	CUMULUS CLOUDING	54 TO 57	72	29.32	7	99.0
0925144012WX	CUMULUS CLOUDING	62 TO 65	65	29.67	9	CUMULUS CLOUDING	50 TO 53	70	29.96	8	98.5
0926035501WX	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	96.4
0926041502WX	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	96.0
0926043003WX	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	94.4
0926044504WX	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	94.4
0926050005WX	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	93.3
0926060006NX	CUMULUS CLOUDING	42 TO 45	92	29.95	0	STRATUS CLOUDING	46 TO 49	98	29.96	1	111.6
0926061807NX	CUMULUS CLOUDING	42 TO 45	92	29.95	0	STRATUS CLOUDING	46 TO 49	98	29.96	1	111.7
0926071210WX	CUMULUS CLOUDING	42 TO 45	92	29.95	0	STRATUS CLOUDING	46 TO 49	82	29.33	7	95.0
0926072011WX	CUMULUS CLOUDING	42 TO 45	92	29.95	0	CUMULUS CLOUDING	42 TO 45	82	29.33	7	91.2

POINT PETRE, SEPT C-BAND

TEST	RECEIVE SITE WEATHER	RECEIVE SITE TEMP	RECEIVE SITE REL HUM	RECEIVE SITE BARO PRES	RECEIVE SITE WIND	TRANSMIT SITE WEATHER	TRANSMIT SITE TEMP	TRANSMIT SITE REL HUM	TRANSMIT SITE BARO PRES	TRANSMIT SITE WIND	SIGNAL STRG
0915203001WC	DARK	66 TO 69	76	29.92	30	DARK	66 TO 69	79	29.92	30	82.3
0915204602WC	DARK	66 TO 69	76	29.92	30	DARK	66 TO 69	79	29.92	30	79.9
0915211003WC	DARK	66 TO 69	76	29.92	30	DARK	66 TO 69	79	29.92	30	80.4
0915212604WC	DARK	66 TO 69	76	29.92	30	DARK	66 TO 69	79	29.92	30	76.6
0916110001WC	STRATUS CLOUDING	66 TO 69	85	29.91	25	RAIN, STAT CLOUD	70 TO 73	59	29.95	20	84.3
0916111602WC	STRATUS CLOUDING	66 TO 69	85	29.91	25	RAIN, STAT CLOUD	70 TO 73	59	29.95	20	83.0
0916113003WC	STRATUS CLOUDING	66 TO 69	85	29.91	25	RAIN, STAT CLOUD	70 TO 73	59	29.95	20	83.3
0916115404WC	STRATUS CLOUDING	66 TO 69	85	29.91	25	RAIN, STAT CLOUD	70 TO 73	59	29.95	20	82.2
0916123505WC	STRATUS CLOUDING	66 TO 69	85	29.91	25	RAIN, STAT CLOUD	70 TO 73	59	29.95	20	76.6
0916133006WC	STRATUS CLOUDING	66 TO 69	85	29.91	25	STRATUS CLOUDING	78 TO 81	65	29.96	23	77.3
0916134507WC	STRATUS CLOUDING	66 TO 69	85	29.91	25	STRATUS CLOUDING	78 TO 81	65	29.96	23	79.2
0916140008WC	STRATUS CLOUDING	66 TO 69	85	29.91	25	STRATUS CLOUDING	78 TO 81	65	29.96	23	79.8
0916151509NC	STRATUS CLOUDING	66 TO 69	85	29.91	25	STRATUS CLOUDING	78 TO 81	65	29.96	20	95.5
0916153510NC	STRATUS CLOUDING	70 TO 73	73	29.86	30	STRATUS CLOUDING	78 TO 81	65	29.92	20	95.0
0916155511NC	STRATUS CLOUDING	70 TO 73	73	29.86	30	STRATUS CLOUDING	78 TO 81	65	29.92	20	95.3
0916161012NC	STRATUS CLOUDING	70 TO 73	73	29.86	30	STRATUS CLOUDING	78 TO 81	65	29.92	20	97.4
0917094501NC	RAIN, STAT CLOUD	54 TO 57	94	29.93	15	STRATUS CLOUDING	54 TO 57	94	29.93	15	102.5
0917100502NC	RAIN, STAT CLOUD	54 TO 57	94	29.93	15	STRATUS CLOUDING	54 TO 57	94	29.93	15	98.6
0917110203WC	STRATUS CLOUDING	50 TO 53	94	30. 1	55	STRATUS CLOUDING	54 TO 57	94	29.93	15	79.0
0917113505WC	STRATUS CLOUDING	50 TO 53	94	30. 1	55	STRATUS CLOUDING	54 TO 57	94	29.93	15	75.5
0917115606WC	STRATUS CLOUDING	50 TO 53	94	30. 1	55	STRATUS CLOUDING	54 TO 57	94	29.93	15	77.5
0917140407WC	STRATUS CLOUDING	54 TO 57	73	30. 3	15	STRATUS CLOUDING	54 TO 57	81	29.42	6	82.9
0917142008WC	STRATUS CLOUDING	54 TO 57	73	30. 3	15	STRATUS CLOUDING	54 TO 57	81	29.42	6	82.5
0917151009WC	STRATUS CLOUDING	54 TO 57	73	30. 3	15	STRATUS CLOUDING	54 TO 57	81	29.42	6	84.8
0917152510WC	STRATUS CLOUDING	54 TO 57	73	30. 3	15	STRATUS CLOUDING	54 TO 57	81	29.42	6	85.2
0917160012WC	STRATUS CLOUDING	54 TO 57	66	30. 5	15	STRATUS CLOUDING	54 TO 57	83	29.42	6	83.3
0918091501WC	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	84.1
0918093502WC	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	82.7
0918095003WC	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	81.6
0918100504WC	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	80.1
0918110005WC	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	83.0
0918111606WC	CLEAR	50 TO 53	81	30.34	10	CUMULUS CLOUDING	50 TO 53	86	29.67	17	85.8
0918113507WC	CUMULUS CLOUDING	54 TO 57	69	30.36	15	CUMULUS CLOUDING	62 TO 65	53	29.70	17	89.1
0918115408WC	CUMULUS CLOUDING	54 TO 57	69	30.36	15	CUMULUS CLOUDING	62 TO 65	53	29.70	17	89.0
0918133209WC	CLEAR	58 TO 61	55	30.36	13	CLEAR	66 TO 69	48	29.71	17	87.6
0918135010WC	CLEAR	58 TO 61	55	30.36	13	CLEAR	66 TO 69	48	29.71	17	67.2
0918140611WC	CLEAR	58 TO 61	55	30.36	13	CLEAR	66 TO 69	48	29.71	17	86.8
0918142512WC	CLEAR	58 TO 61	55	30.36	13	CLEAR	66 TO 69	48	29.71	17	89.9

0918153013WC	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	90.5
0918155014WC	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	90.1
0918165015WC	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	92.9
0918170516WC	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	90.4
0918172017WC	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	89.6
0918173518WC	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	90.4
0918175519WC	CUMULUS CLOUDING	58 TO 61	52	30. 7	10	CLEAR	66 TO 69	45	29.71	17	91.0
0918190520NC	CUMULUS CLOUDING	54 TO 57	52	30. 7	10	CLEAR	62 TO 65	45	29.71	17	104.9
0918193021NC	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	62 TO 65	40	29.73	15	103.4
0918194522NC	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	62 TO 65	40	29.73	15	103.5
0918205023WC	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	54 TO 57	69	29.73	15	85.3
0918210524WC	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	54 TO 57	69	29.73	15	85.1
0918212025WC	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	54 TO 57	69	29.73	15	86.2
0918214026WC	CUMULUS CLOUDING	54 TO 57	49	30.11	20	CLEAR	54 TO 57	69	29.73	15	86.5
0923032504WC	CLEAR	46 TO 49	96	30. 2	20	LIGHT FOG	54 TO 57	86	29.38	9	66.3
0923034005WC	LIGHT FOG	46 TO 49	96	29.99	25	LIGHT FOG	54 TO 57	81	29.37	9	67.1
0923035506WC	LIGHT FOG	46 TO 49	96	29.99	25	LIGHT FOG	54 TO 57	81	29.37	9	65.5
0923041007WC	LIGHT FOG	46 TO 49	96	29.99	25	LIGHT FOG	54 TO 57	81	29.37	9	66.5
0923042508WC	LIGHT FOG	46 TO 49	96	29.99	25	LIGHT FOG	54 TO 57	81	29.37	9	66.6
0923051009WC	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	85.8
0923052510WC	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	85.1
0923054511WC	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	84.2
0923060012WC	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	84.6
0923061513WC	CLEAR	46 TO 49	99	29.98	25	CLEAR	50 TO 53	78	29.35	9	83.5
0923065514WC	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	84.0
0923071515WC	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	83.3
0923073016WC	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	82.6
0923075017WC	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	82.0
0923080518WC	CLEAR	42 TO 45	99	29.96	20	CLEAR	50 TO 53	82	29.32	12	82.6
0923093019WC	CLEAR	50 TO 53	99	29.94	20	HAZY	62 TO 65	58	29.30	12	81.9
0923094520WC	CLEAR	50 TO 53	99	29.94	20	HAZY	62 TO 65	58	29.30	12	82.1
0924101801WC	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	91.1
0924103502WC	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	89.7
0924105003WC	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	89.9
0924110504NC	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	59	29.75	8	107.4
0924112005NC	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, STAT CLOUD	58 TO 61	98	29.13	8	104.6
0924132506WC	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	90.7
0924134507WC	RAIN, STAT CLOUD	58 TO 61	99	29.68	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	88.5
0924140208WC	CUMULUS CLOUDING	54 TO 57	85	29.74	15	RAIN, CUM CLOUD	58 TO 61	98	.13	8	92.9
0924142009WC	CUMULUS CLOUDING	54 TO 57	85	29.74	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	92.0
0924144010WC	CUMULUS CLOUDING	54 TO 57	85	29.74	15	RAIN, CUM CLOUD	58 TO 61	98	29.13	8	90.4

0924152511WC	CUMULUS CLOUDING	54 TO 57	85	29.74	15	STRATUS CLOUDING	58 TO 61	93	29.14	8	96.2
0924154412WC	CUMULUS CLOUDING	54 TO 57	85	29.74	15	STRATUS CLOUDING	58 TO 61	93	29.14	8	95.5
0924155813WC	CUMULUS CLOUDING	54 TO 57	85	29.74	15	STRATUS CLOUDING	58 TO 61	93	29.14	8	97.0
0924161214WC	CUMULUS CLOUDING	54 TO 57	85	29.74	15	STRATUS CLOUDING	58 TO 61	93	29.14	8	95.2
0925091001WC	STRATUS CLOUDING	46 TO 49	77	29.95	15	RAIN, CUM CLOUD	50 TO 53	90	29.30	9	92.4
0925093002WC	STRATUS CLOUDING	46 TO 49	77	29.95	15	RAIN, CUM CLOUD	50 TO 53	90	29.30	9	92.5
0925095003WC	STRATUS CLOUDING	46 TO 49	77	29.95	15	RAIN, CUM CLOUD	50 TO 53	90	29.30	9	92.7
0925101004WC	STRATUS CLOUDING	46 TO 49	77	29.95	15	RAIN, CUM CLOUD	50 TO 53	90	29.30	9	93.1
0925110005WC	STRATUS CLOUDING	46 TO 49	73	29.60	13	CUMULUS CLOUDING	54 TO 57	88	29.31	9	94.2
0925111806WC	STRATUS CLOUDING	46 TO 49	73	29.60	13	CUMULUS CLOUDING	54 TO 57	88	29.31	9	94.4
0925113507WC	STRATUS CLOUDING	46 TO 49	73	29.60	13	CUMULUS CLOUDING	54 TO 57	88	29.31	9	94.5
0925115008WC	STRATUS CLOUDING	46 TO 49	73	29.60	13	CUMULUS CLOUDING	54 TO 57	88	29.31	9	93.5
0925134509NC	CUMULUS CLOUDING	62 TO 65	65	29.67	9	CUMULUS CLOUDING	54 TO 57	72	29.32	7	99.9
0925140210NC	CUMULUS CLOUDING	62 TO 65	65	29.67	9	CUMULUS CLOUDING	54 TO 57	72	29.32	7	105.9
0925141811WC	CUMULUS CLOUDING	62 TO 65	65	29.67	9	CUMULUS CLOUDING	54 TO 57	72	29.32	7	90.4
0926035501NC	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	101.7
0926041502NC	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	101.6
0926043003NC	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	99.5
0926044504WC	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	89.5
0926050005WC	CUMULUS CLOUDING	46 TO 49	88	29.96	1	CUMULUS CLOUDING	46 TO 49	94	29.96	1	88.9
0926060006WC	CUMULUS CLOUDING	42 TO 45	92	29.95	0	STRATUS CLOUDING	46 TO 49	98	29.96	1	91.2
0926061807WC	CUMULUS CLOUDING	42 TO 45	92	29.95	0	STRATUS CLOUDING	46 TO 49	98	29.96	1	91.4
0926063508WC	CUMULUS CLOUDING	42 TO 45	92	29.95	0	STRATUS CLOUDING	46 TO 49	98	29.96	1	89.6
0926065009WC	CUMULUS CLOUDING	42 TO 45	92	29.95	0	STRATUS CLOUDING	46 TO 49	98	29.96	1	89.2
0926071210WC	CUMULUS CLOUDING	42 TO 45	92	29.95	0	CUMULUS CLOUDING	42 TO 45	98	29.96	1	89.5

APPENDIX C

ROCHESTER WEATHER DATA

PRECEDING PAGE BLANK-NOT FILMED.

LOCAL CLIMATOLOGICAL DATA

U S DEPARTMENT OF COMMERCE - MAURICE H. STANS, Secretary
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION -- ENVIRONMENTAL DATA SERVICE

ROCHESTER, NEW YORK
ROCHESTER-MONROE COUNTY AP
AUGUST 1969

Latitude 43° 07' N Longitude 77° 40' W Elevation (ground) 547 ft Standard time used EASTERN

Date	Temperature (°F) Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days (Base 65°) Heating	Cooling	Weather types shown by code 1-9 on dates of occurrence (1 Fog, 2 Heavy Fog X, 3 Thunderstorm, 4 Sleet, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke Haze, 9 Blowing Snow)	Snow, Sleet, or Ice on ground at 07AM (In)	Precipitation Water equivalent (In)	Snow, sleet (In)	Avg station pressure (In) Elev 555 feet m s l	Wind Resultant direction	Resultant speed m p h	Average speed m p h	Fastest mile Speed m p h	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover (Tenths) Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	88	65	77	5	65	0	12	3 8	0	0	0	29.37	20	6.4	7.9	17	SW	7.9	54	6	7	1
2	81	65	73	1	66	0	8	1 3 5 8	0	.92	0	29.38	21	3.7	4.9	25	W	3.3	23	8	7	2
3	82	61	72	0	64	0	7	1 8	0	0	0	29.47	24	4.3	5.8	10	W	11.6	80	7	6	3
4	77	65	71	-1	64	0	6	8	0	0	0	29.44	19	2.8	3.9	5	S	0.7	5	10	10	4
5	83	63	73	2	64	0	8	1 8	0	.03	0	29.41	28	2.1	3.7	9	W	8.8	61	8	7	5
6	85	61	73	2	64	0	8	8	0	0	0	29.42	25	6.4	7.6	14	W	10.8	76	5	4	6
7	88	66	77	6	64	0	12	8	0	0	0	29.35	21	11.3	11.5	19	SW	9.8	69	6	6	7
8	83	71	77	6	62	0	12	8	0	0	0	29.12	24	13.8	15.4	31	W	10.8	76	5	7	8
9	82	66	74	3	63	0	9		0	.18	0	29.14	26	10.5	11.1	21	W	7.7	54	9	9	9
10	75	58	67	-4	62	0	2		0	.18	0	29.19	30	8.8	9.2	19	NW	7.2	51	9	8	10
11	77	55	66	-5	55	0	1		0	0	0	29.39	31	2.2	6.2	12	NW	12.4	88	3	4	11
12	81	57	69	-2	57	0	4		0	0	0	29.47	18	1.4	4.9	10	NE	11.7	83	4	3	12
13	84	55	70	-1	56	0	5		0	0	0	29.52	23	6.0	6.6	14	SW	14.1	100	1	1	13
14	89	62	76	5	60	0	11	8	0	0	0	29.50	20	6.3	6.8	11	SW	11.5	82	3	3	14
15	88	64	76	6	63	0	11	8	0	0	0	29.50	20	4.8	5.3	15	S	6.2	44	9	9	15
16	87	70	79	9	69	0	14	8	0	.10	0	29.35	20	8.2	8.6	20	S	4.8	35	9	9	16
17	83	69	76	6	68	0	11	1 8	0	.20	0	29.26	24	10.1	10.2	17	W	4.2	30	9	9	17
18	85	68	77	7	67	0	12	8	0	0	0	29.29	23	9.7	10.2	17	SW	10.2	74	6	6	18
19	79	61	70	0	59	0	5		0	.14	0	29.25	29	7.9	8.6	17	NW	10.7	78	2	3	19
20	70	51	61	-9	46	4	0		0	0	0	29.44	34	6.7	8.8	14	NW	13.0	94	4	2	20
21	74	49	62	-8	47	3	0		0	0	0	29.49	28	4.6	6.6	14	NW	13.7	100	0	0	21
22	80	49	65	-4	52	0	0		0	0	0	29.54	26	6.6	7.1	12	W	13.7	100	0	0	22
23	85	55	70	1	59	0	5		0	0	0	29.56	26	4.2	6.8	11	W	12.5	92	1	1	23
24	91	60	76	7	63	0	11	1 8	0	0	0	29.50	27	7.5	8.6	16	W	13.6	100	0	0	24
25	89	61	75	6	60	0	10	1 8	0	0	0	29.37	28	9.0	10.2	21	NW	11.2	83	3	3	25
26	72	57	65	-4	50	0	0		0	0	0	29.51	36	8.2	9.4	17	N	12.8	95	2	3	26
27	77	46*	62	-6	48	3	0		0	0	0	29.63	24	2.5	5.5	11	W	13.4	100	4	3	27
28	88	60	74	6	55	0	9		0	0	0	29.61	22	7.8	8.2	15	SW	12.9	96	1	1	28
29	88	64	76	8	61	0	11	8	0	.07	0	29.58	23	7.9	8.9	14	SW	5.8	44	6	6	29
30	90	66	78	11	65	0	13	1 8	0	0	0	29.61	25	5.9	7.1	13	W	7.8	59	1	1	30
31	92*	70	81	14	65	0	16	1 8	0	0	0	29.59	24	8.8	9.4	17	SW	11.4	86	1	1	31
	Sum 2573	Sum 1890				Total 10	Total 233			Total 1.82	Total 0	For the month 29.43	25	5.2	7.9	31	W	Total 306.2	% for month	Sum 142	Sum 139	
	Avg. 83.0	Avg. 61.0	Avg 72.0	Dep. 2.3	Avg. 60	Dep. -21	Dep.			Dep. -0.90						Date	08	Possible 431.1	71	Avg. 4.6	Avg. 4.5	

Number of days				Season to date		Number of days	
Maximum Temp		Minimum Temp.		Total	Total	Precipitation ≥ .01 inch	8
≥ 32°	≥ 90° ‡	≤ 32°	≤ 0°	28	547	Snow, sleet ≥ 1.0 inch	0
0	3	0	0	Dep -12	Dep.	Thunderstorms	2
						Heavy fog X	0

Greatest in 24 hours and dates Precipitation		Snow, Sleet		Greatest depth on ground of snow, sleet or ice and date
.92	2	0		0

HOURLY PRECIPITATION (Water equivalent in inches)

Date	A.M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P.M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2		.43	T			.01								.25	T		T	.23							2
3																									3
4																									4
5																	.02	.01							5
6																									6
7																									7
8																									8
9																	.01	.15	T			T	.02	T	9
10	.17	T	T	T	T				.01	T															10
11																									11
12																									12
13																									13
14																									14
15																									15
16																		.01	.04	T	T	.03	T	.02	16
17	.02	.01	.04	.03	.02	.02	T			.03	.02	.01	T	T											17
18																									18
19					.11	.03	T																		19
20																									20
21																									21
22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																									28
29															.07										29
30																									30
31																									31

* Extreme temperatures for the month. May be the last of more than one occurrence.
– Below zero temperature or negative departure from normal.
‡ ≥ 70° at Alaskan stations.
+ Also on an earlier date, or dates.
X Heavy fog restricts visibility to ¼ mile or less.
T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.
The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North, and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.

Any errors detected will be corrected and changes in summary data will be annotated in the annual summary.

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I certify that this is an official publication of the Environmental Science Services Administration, and is compiled from records on file at the National Weather Records Center, Asheville, North Carolina 28801.

William H. Haggard

Director, National Weather Records Center

SUMMARY BY HOURS

Hour (Local time)	Averages: Sky cover (In tenths)	Station pressure (In)	Dry bulb (°F)	Wet bulb (°F)	Rel hum %	Dew point (°F)	Wind speed (m p h)	Resultant wind Direction	Speed (m p h)
01	4	29.42	65	62	84	60	5.9	23	4.3
04	4	29.42	63	61	88	59	6.3	23	5.1
07	4	29.45	66	63	84	61	7.1	22	5.0
10	4	29.46	76	67	63	62	9.7	25	6.7
13	5	29.43	81	67	48	59	10.9	27	8.3
16	5	29.40	81	67	47	58	10.5	28	7.2
19	5	29.41	74	65	64	60	7.0	25	4.0
22	5	29.42	68	63	79	61	5.7	22	4.5

USCOMM—ESSA—ASHEVILLE 350

OBSERVATIONS AT 3-HOUR INTERVALS

DAY 01

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	8	CIR	10			67	65	90	64	20	5
04	5	UNL	10			66	64	90	63	20	6
07	6	100	8		H	70	67	86	65	18	9
10	6	UNL	6		H	81	72	63	67	20	9
13	3	UNL	7			85	71	49	64	23	10
16	8	40	7			86	72	50	65	26	9
19	8	120	6		H	75	68	71	65	07	6
22	10	70	6		TH	71	70	93	69	18	5

DAY 02

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	10	40	7			69	68	93	67	25	4
04	10	45	7			66	65	97	65	23	4
07	10	CIR	1	8	GF	69	68	97	68	19	4
10	9	UNL	4		H	74	70	82	68	16	5
13	8	33	4		H	80	72	67	68	22	6
16	5	UNL	2	8	H	77	72	76	69	20	3
19	5	UNL	4		TH	71	65	73	62	10	3
22	8	100	7			65	64	97	64	24	5

DAY 03

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	8		GF	65	64	97	64	23	4
04	0	UNL	7			62	61	97	61	24	4
07	1	UNL	5		GFH	65	64	97	64	24	5
10	7	UNL	15			74	68	71	64	23	8
13	8	UNL	15			78	68	58	62	27	8
16	9	UNL	15			80	69	56	63	27	4
19	10	80	15			75	68	71	65	10	4
22	8	100	15			70	67	87	66	19	3

DAY 04

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	10	CIR	12			67	66	97	66	18	3
04	10	90	8			65	64	97	64	23	4
07	10	90	7			66	65	97	65	24	4
10	10	CIR	7			73	69	82	67	23	4
13	10	100	8			76	68	66	64	21	3
16	10	120	10			76	66	60	61	14	3
19	10	120	10			73	67	71	63	13	3
22	10	120	10			69	66	87	65	13	3

DAY 05

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	10	95	10			68	66	90	65	00	0
04	10	90	10			65	64	97	64	23	4
07	7	UNL	4		GF	67	66	93	65	22	5
10	6	UNL	7			77	67	60	62	28	5
13	8	CIR	12			81	68	51	61	30	7
16	10	35	8			79	68	56	62	03	5
19	7	70	7			73	70	87	69	00	0
22	0	UNL	7			65	64	97	64	00	0

DAY 06

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	3	UNL	7			63	62	97	62	22	3
04	3	UNL	7			61	60	97	60	21	8
07	5	UNL	5		H	65	64	93	63	23	4
10	8	100	5		H	77	71	74	68	29	10
13	5	UNL	7			80	70	60	65	24	6
16	5	UNL	10			83	70	53	64	28	10
19	2	UNL	7			76	69	69	65	27	6
22	0	UNL	7			70	66	81	64	20	6

DAY 07

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	5	UNL	7			69	66	84	64	21	8
04	5	UNL	7			67	64	87	63	23	8
07	0	UNL	5		H	70	66	79	63	20	9
10	9	100	4		H	79	71	67	67	20	11
13	7	CIR	7			85	71	49	64	22	12
16	8	120	5		H	85	72	51	65	22	12
19	8	CIR	5		H	81	70	58	65	20	10
22	10	CIR	7			79	69	58	63	22	10

DAY 08

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	10	70	8			76	69	69	65	19	10
04	10	46	8			76	68	66	64	22	11
07	2	UNL	5		H	75	69	74	66	20	9
10	9	35	5		H	80	71	65	67	25	13
13	4	UNL	10			83	68	46	60	26	23
16	2	UNL	15			81	66	44	57	26	20
19	7	85	15			74	66	58	58	25	13
22	8	60	10			73	65	66	61	20	8

DAY 09

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	10	70	12			70	66	79	63	27	7
04	10	65	12			69	65	81	63	25	6
07	8	70	10			68	64	81	62	24	7
10	10	30	10			77	69	66	64	25	15
13	7	46	15			82	68	49	61	27	18
16	8	45	15			80	69	56	63	27	10
19	10	40	10			70	68	90	67	29	10
22	10	45	7		RW	67	65	90	64	21	4

DAY 10

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	10	13	7		RW	66	65	97	65	28	4
04	10	70	10		RW	66	65	97	65	29	3
07	8	80	7			64	63	97	63	30	7
10	10	16	12			71	68	87	67	32	9
13	8	25	15			74	65	62	60	32	13
16	9	38	15			72	63	59	57	31	15
19	9	70	15			68	62	73	59	28	6
22	4	UNL	15			61	59	90	58	27	7

DAY 11

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	15			57	56	96	56	25	5
04	3	UNL	15			57	56	96	56	26	5
07	0	UNL	10			62	61	93	60	27	5
10	1	UNL	15			71	62	61	57	28	7
13	7	80	15			73	61	50	53	01	5
16	3	UNL	15			76	63	47	56	04	8
19	7	70	15			69	59	53	51	05	5
22	10	70	15			66	60	68	55	18	3

DAY 12

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	2	UNL	15			60	58	87	56	19	3
04	0	UNL	15			58	57	93	56	18	3
07	3	UNL	15			61	58	84	56	19	5
10	0	UNL	12			74	64	58	58	17	4
13	7	45	15			78	62	39	51	23	3
16	6	46	15			79	65	47	57	36	5
19	1	UNL	15			73	64	62	59	06	[illegible]
22	0	UNL	15			63	61	87	59	25	4

DAY 13

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	12			60	58	87	56	23	3
04	0	UNL	12			58	57	93	56	22	4
07	0	UNL	10			62	60	87	58	20	5
10	2	UNL	10			75	66	60	60	23	5
13	2	UNL	10			82	64	35	52	27	10
16	1	UNL	15			84	66	31	50	23	13
19	0	UNL	10			76	62	43	52	24	5
22	0	UNL	8			67	63	78	60	18	5

DAY 14

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	10			64	60	81	58	20	5
04	7	CIR	10			65	61	81	59	20	8
07	1	UNL	6		H	70	64	71	60	20	8
10	0	UNL	6		H	78	68	60	63	22	6
13	4	UNL	6		H	85	69	45	61	16	8
16	4	UNL	7			85	68	35	57	23	9
19	1	UNL	7			81	68	51	61	17	6
22	3	UNL	7			72	67	76	64	19	5

DAY 15

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	6	UNL	7			66	62	81	60	23	3
04	8	UNL	7			64	61	84	59	20	4
07	10	UNL	6		H	68	65	87	64	20	5
10	5	UNL	6		H	80	71	62	66	22	7
13	10	140	6		H	86	68	39	58	21	5
16	10	120	6		H	87	68	37	58	13	3
19	10	100	7			81	72	63	67	22	5
22	10	CIR	8			76	71	76	68	17	5

DAY 16

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	10	CIR	7			74	70	82	68	20	3
04	10	CIR	7			70	68	90	67	24	4
07	[illegible]	CIR	8		H	74	71	86	69	[illegible]	[illegible]
10	3	UNL	6		H	83	75	67	71	17	6
13	10	100	5		H	84	74	61	69	18	6
16	10	100	6		H	83	73	63	69	18	7
19	10	35	8		RW	75	71	82	68	18	7
22	10	100	8		RW	71	69	90	68	22	11

DAY 17

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	10	35	10		RW	70	68	90	67	23	8
04	10	45	6		RW	69	68	93	67	23	8
07	[illegible]	[illegible]	[illegible]		[illegible]	71	70	93	[illegible]	[illegible]	[illegible]
10	10	12	3		RWH	74	71	87	70	24	10
13	10	80	7		RW	78	71	71	68	25	12
16	8	100	7			80	72	67	68	25	10
19	8	CIR	8			76	70	74	67	25	[illegible]
22	10	CIR	8			73	69	82	67	23	8

DAY 18

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	8	CIR	8			72	69	87	68	22	7
04	3	UNL	10			70	67	86	65	22	4
07	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	3	UNL	3		H	80	72	69	69	25	12
13	9	UNL	6		H	85	73	57	68	25	13
16	4	UNL	7			85	73	57	68	25	13
19	10	UNL	8			78	71	[illegible]	[illegible]	[illegible]	[illegible]
22	9	UNL	10			74	68	74	65	21	8

DAY 19

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	8	UNL	10			72	67	79	65	25	7
04	10	80	10			71	68	86	66	25	6
07	10	45	8			71	68	86	66	30	8
10	0	UNL	15			74	62	50	54	30	[illegible]
13	0	UNL	15			78	63	44	54	28	8
16	1	UNL	15			77	63	43	53	31	13
19	0	UNL	15			70	61	59	55	27	5
22	0	UNL	15			61	57	81	55	32	4

DAY 20

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	15			62	56	56	47	03	8
04	0	UNL	15			58	53	70	48	03	6
07	2	UNL	15			62	55	63	49	02	7
10	[illegible]	UNL	15			63	55	52	45	35	11
13	7	UNL	15			66	55	47	45	31	7
16	4	UNL	15			70	55	35	41	32	9
19	0	UNL	15			65	53	45	43	30	6
22	0	UNL	15			53	50	80	47	27	7

DAY 21

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	15			51	49	90	48	25	5
04	0	UNL	15			51	50	93	49	22	7
07	0	UNL	15			57	55	87	53	23	5
10	2	UNL	15			68	59	52	49	30	6
13	0	UNL	15			72	58	35	43	36	5
16	0	UNL	15			74	57	33	43	32	10
19	0	UNL	15			66	56	51	47	27	5
22	0	UNL	15			54	51	83	49	23	5

DAY 22

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	15			53	52	93	51	23	6
04	0	UNL	15			51	50	93	49	24	5
07	0	UNL	15			55	53	90	52	24	5
10	0	UNL	15			72	62	57	56	25	7
13	0	UNL	15			78	62	39	51	29	7
16	0	UNL	15			80	62	35	50	28	7
19	0	UNL	15			69	59	55	52	25	6
22	0	UNL	15			61	56	75	53	25	6

DAY 23

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	15			60	57	84	55	21	5
04	0	UNL	15			56	55	93	54	23	5
07	0	UNL	15			61	58	84	56	21	6
10	0	UNL	15			78	67	54	60	27	8
13	1	UNL	15			85	69	43	60	32	7
16	2	UNL	15			85	70	46	62	33	8
19	0	UNL	15			78	68	60	63	18	5
22	0	UNL	15			69	65	79	62	26	5

DAY 24

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	12			66	63	87	62	21	4
04	0	UNL	12			61	60	93	59	23	4
07	0	UNL	5		H	67	64	87	63	24	5
10	0	UNL	8			82	71	56	65	27	7
13	0	UNL	12			87	72	48	65	27	12
16	0	UNL	15			89	72	42	63	31	15
19	0	UNL	12			79	69	60	64	27	7
22	0	UNL	12			69	65	79	62	24	6

DAY 25

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	12			67	64	86	62	25	6
04	0	UNL	6		GF	64	63	93	62	24	5
07	0	UNL	4		GF	66	66	90	65	25	5
10	7	UNL	7			81	67	54	63	26	12
13	0	UNL	[illegible]			88	68	30	53	27	18
16	7	UNL	15			87	68	36	57	31	13
19	9	70	15			74	65	60	59	31	6
22	6	70	15			69	64	76	61	31	6

DAY 26

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	6	69	15			69	61	61	55	02	8
04	3	UNL	15			65	60	73	56	02	7
07	0	UNL	15			66	60	70	56	02	9
10	5	UNL	15			68	59	57	52	03	11
13	3	UNL	15			69	56	44	46	34	13
16	0	UNL	15			70	55	35	41	34	10
19	0	UNL	15			62	53	52	44	32	6
22	10	46	15			60	53	65	48	[illegible]	1

DAY 27

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	6	49	15			56	52	78	49	00	0
04	0	UNL	15			49	48	93	47	19	2
07	8	UNL	15			51	48	83	46	19	6
10	8	UNL	15			64	55	54	47	19	7
13	9	UNL	15			72	60	46	51	31	10
16	0	UNL	15			77	59	33	46	34	5
19	0	UNL	15			68	57	51	49	25	5
22	0	UNL	15			63	56	65	51	16	3

DAY 28

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	15			62	57	73	53	20	5
04	0	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
07	0	UNL	15			63	57	68	52	21	6
10	[illegible]	UNL	15			77	64	48	56	22	10
13	3	UNL	15			86	67	36	56	21	10
16	[illegible]	UNL	15			87	67	34	55	25	9
19	0	UNL	8			75	65	64	60	25	6
22	0	UNL	10			70	62	64	57	22	5

DAY 29

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	10			67	61	70	57	22	10
04	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9
07	8	UNL	6		H	67	60	68	56	22	8
10	9	UNL	5		H	81	68	51	61	23	9
13	4	UNL	4		H	87	71	43	62	28	10
16	5	UNL	2	8	H	77	70	71	67	23	10
19	7	CIR	4		H	76	69	71	66	24	6
22	6	CIR	4		H	71	66	76	63	10	2

DAY 30

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	4		H	67	66	86	62	20	3
04	0	UNL	4		H	66	65	[illegible]	[illegible]	[illegible]	5
07	1	UNL	2		GF	68	66	81	62	21	5
10	0	UNL	2	8	H	79	71	67	67	22	8
13	3	UNL	4		H	88	73	48	66	28	8
16	3	UNL	4		H	89	73	47	66	29	9
19	5	UNL	3		H	79	71	67	67	27	6
22	4	UNL	3		H	75	69	74	66	23	5

DAY 31

HOUR	SKY COVER (Tenths)	CEILING (Hund. ft.)	VISIBILITY (Whole miles)	VISIBILITY (16ths mile)	WEATHER	DRY BULB °F	WET BULB °F	REL. HUM. %	DEW PT. °F	WIND DIR.	WIND SPEED (Knots)
01	0	UNL	3		H	72	68	82	66	21	7
04	0	UNL	5		H	72	68	82	66	22	6
07	0	UNL	2		GFH	72	69	84	67	22	5
10	0	[illegible]	[illegible]		H	85	73	[illegible]	66	[illegible]	[illegible]
13	2	UNL	5		H	90	71	39	62	25	12
16	3	UNL	5		H	91	71	37	61	27	11
19	4	UNL	5		H	81	69	54	63	25	7
22	3	UNL	4		H	75	68	69	64	22	7

NOTES

CEILING COLUMN

UNL indicates an unlimited ceiling
CIR indicates a cirriform cloud ceiling of unknown height

WEATHER COLUMN

- * Tornado
- T Thunderstorm
- Q Squall
- R Rain
- RW Rain showers
- ZR Freezing rain
- L Drizzle
- ZL Freezing drizzle
- S Snow
- SP Snow pellets
- IC Ice crystals
- SW Snow showers
- SG Snow grains
- E Sleet
- A Hail
- AP Small hail
- F Fog
- IF Ice fog
- GF Ground fog
- BD Blowing dust
- BN Blowing sand
- BS Blowing snow
- BY Blowing spray
- K Smoke
- H Haze
- D Dust

WIND COLUMNS

Directions are those from which the wind blows, indicated in tens of degrees from true North, i.e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots, multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA

Other observational data contained in records on file can be furnished at cost via microfilm or microfiche copies of the original records. Inquiries as to availability and costs should be addressed to: Director, National Weather Records Center, Federal Building, Asheville, N. C. 28801

STATION: ROCHESTER N Y   YEAR & MONTH: 69 08

LOCAL CLIMATOLOGICAL DATA

U S DEPARTMENT OF COMMERCE - MAURICE H. STANS, Secretary
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

ROCHESTER, NEW YORK
ROCHESTER-MONROE COUNTY AP
SEPTEMBER 1969

Latitude 43 07 N Longitude 77 40' W Elevation (ground) 547 ft Standard time used EASTERN

Date	Temperature °F Maximum	Minimum	Average	Departure from normal	Average dew point	Degree days (Base 65°) Heating	Cooling	Weather types shown by code 1-9 on dates of occurrence (1 Fog, 2 Heavy Fog X, 3 Thunderstorms, 4 Sleet, 5 Hail, 6 Glaze, 7 Duststorm, 8 Smoke, Haze, 9 Blowing Snow)	Snow, Sleet or Ice on ground at 07AM In.	Precipitation Water equivalent In.	Snow, Sleet In.	Avg. station pressure In. Elev. 555 feet m.s.l.	Wind Resultant direction	Resultant speed m.p.h.	Average speed m.p.h.	Fastest mile Speed m.p.h.	Direction	Sunshine Hours and tenths	Percent of possible	Sky cover (Tenths) Sunrise to sunset	Midnight to midnight	Date
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	90*	67	79	12	64	0	14	1 8	0	0	0	29.56	25	7.0	8.1	15	SW	7.2	55	4	5	1
2	74	63	69	2	62	0	4	8	0	0	0	29.58	05	6.4	6.9	14	N	0.0	0	10	10	2
3	80	55	68	2	59	0	3	8	0	0	0	29.59	02	3.6	4.8	11	N	12.1	92	5	5	3
4	83	59	71	5	62	0	6	2 8	0	0	0	29.63	09	3.1	5.5	15	NE	7.5	57	9	7	4
5	88	63	76	10	64	0	11	1 8	0	T	0	29.54	19	6.2	8.2	17	SW	6.4	49	9	8	5
6	86	71	79	14	68	0	14	8	0	.12	0	29.41	24	9.7	10.4	18	SW	7.5	58	6	7	6
7	81	65	73	8	66	0	8	3 8	0	.08	0	29.34	25	5.7	8.2	17	W	2.3	18	10	9	7
8	77	55	66	1	56	0	1		0	0	0	29.32	29	6.5	7.1	17	NW	8.4	65	6	6	8
9	68	49	59	-6	50	6	0		0	0	0	29.29	27	8.6	9.2	16	W	4.9	38	6	6	9
10	70	49	60	-4	42	5	0		0	0	0	29.47	28	9.4	10.1	17	W	10.4	81	3	4	10
11	70	47	59	-5	47	6	0		0	T	0	29.52	24	9.6	10.1	20	SW	1.6	13	10	7	11
12	79	50	65	1	49	0	0		0	0	0	29.48	23	12.6	13.2	32	SW	10.7	84	3	2	12
13	84	62	73	9	57	0	8		0	0	0	29.49	25	10.4	10.9	17	W	11.7	92	2	2	13
14	86	56	71	8	57	0	6		0	0	0	29.59	21	5.8	7.1	13	S	12.6	100	5	5	14
15	84	63	74	11	56	0	9	8	0	T	0	29.49	23	10.3	10.9	20	W	7.3	58	7	7	15
16	81	65	73	10	58	0	8	1 8	0	.04	0	29.40	22	10.7	11.1	18	W	0.3	2	10	10	16
17	66	51	59	-3	55	6	0	1	0	1.19	0	29.46	01	4.7	7.1	17	NE	0.0	0	10	9	17
18	63	44	54	-8	44	11	0		0	0	0	29.76	02	1.7	4.0	13	NE	8.0	65	6	5	18
19	63	39*	51	-10	42	14	0		0	0	0	29.90	07	4.3	5.5	13	NE	10.9	89	8	6	19
20	69	45	57	-4	44	8	0		0	0	0	29.84	12	6.1	6.6	11	SE	8.1	66	5	3	20
21	74	46	60	-1	48	5	0		0	0	0	29.78	12	3.6	5.9	10	NE	11.3	93	2	2	21
22	77	46	62	1	49	3	0		0	0	0	29.61	14	3.0	5.3	11	E	12.2	100	0	0	22
23	79	47	63	3	50	2	0		0	0	0	29.34	19	3.9	5.9	10	S	8.6	71	6	5	23
24	66	53	60	0	55	5	0	1 8	0	.34	0	29.20	31	4.0	8.3	15	N	0.0	0	10	10	24
25	55	51	53	-6	46	12	0		0	T	0	29.37	02	6.1	6.8	10	N	0.0	0	10	10	25
26	66	51	59	0	48	6	0		0	0	0	29.40	14	1.9	4.6	13	W	7.3	61	6	6	26
27	64	47	56	-3	49	9	0		0	0	0	29.37	23	8.3	8.8	16	SW	0.7	6	9	6	27
28	62	44	53	-6	45	12	0		0	T	0	29.47	27	7.3	8.2	18	W	6.1	34	8	6	28
29	63	42	53	-5	42	12	0		0	0	0	29.58	26	4.4	7.2	14	W	4.8	40	8	9	29
30	72	49	61	3	46	4	0		0	T	0	29.37	22	9.0	10.9	25	SW	2.9	25	8	8	30

Sum 2220	Sum 1594				Total 126	Total 92	
Avg 74.0	Avg 53.1	Avg 63.6	Dep 1.2	Avg 53	Dep 0	Dep	
					Season to date Total 154	Total 639	
					Dep -12	Dep	

Number of days: Maximum Temp ≥ 32° 0; ≥ 90° ‡ 1; Minimum Temp ≤ 32° 0; ≤ 0° 0

Number of days	
Precipitation ≥ .01 inch	5
Snow, sleet ≥ 1.0 inch	0
Thunderstorms	1
Heavy fog X	1

Precipitation: Total 1.77, Dep -0.76; Snow, Sleet Total 0

For the month: Station pressure 29.50; Resultant direction 24; Resultant speed 3.5; Average speed 7.9; Fastest mile 32, SW, Date 12

Sunshine: Total 189.8; Possible 374.9; % for month 51

Sky cover: Sum 201, Avg 6.7; Sum 185, Avg 6.2

Greatest in 24 hours and dates: Precipitation 1.23, 16-17; Snow, Sleet 0

Greatest depth on ground of snow, sleet or ice and date: 0

HOURLY PRECIPITATION Water equivalent in inches

Date	A.M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	P.M. Hour ending at 1	2	3	4	5	6	7	8	9	10	11	12	Date
1																									1
2																									2
3																									3
4																									4
5																			T	T	T	T			5
6								.09	.03	T	T														6
7										.08															7
8																									8
9																									9
10																									10
11													T	T	T										11
12																									12
13																									13
14																									14
15																		T							15
16																			T	T	T	T	T	.04	16
17	.03	.09	.16	.04	.04	.10	.32	.13	.08	.09	.01	.04	.02	.03	.01	T	T								17
18																									18
19																									19
20																									20
21																									21
22																									22
23																									23
24									T	.20	.08	.01	.02	.01	.01	.01	T	T	T	T	T	T	T	T	24
25	T	T																							25
26																									26
27																									27
28													T	T	T			T	T						28
29																									29
30					T	T																			30

- * Extreme temperatures for the month May be the last of more than one occurrence
- – Below zero temperature or negative departure from normal.
- ‡ ≥ 70° at Alaskan stations.
- + Also on an earlier date, or dates.
- X Heavy fog restricts visibility to ¼ mile or less.
- T In the Hourly Precipitation table and in columns 9, 10, and 11 indicates an amount too small to measure.

The season for degree days begins with July for heating and with January for cooling.
Data in columns 6, 12, 13, 14, and 15 are based on 8 observations per day at 3-hour intervals.
Wind directions are those from which the wind blows. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. Figures for directions are tens of degrees from true North; i.e., 09 = East, 18 = South, 27 = West, 36 = North and 00 = Calm. When directions are in tens of degrees in Col. 17, entries in Col. 16 are fastest observed 1-minute speeds. If the / appears in Col. 17, speeds are gusts.

Any errors detected will be corrected and changes in summary data will be annotated in the annual summary

I certify that this is an official publication of the Environmental Science Services Administration, and is compiled from records on file at the National Weather Records Center, Asheville, North Carolina 28801

William H. Haggard

Director, National Weather Records Center

SUMMARY BY HOURS

Hour (Local time)	Averages: Sky cover (In tenths)	Station pressure (In.)	Dry bulb (°F)	Wet bulb (°F)	Rel. hum. %	Dew point (°F)	Wind speed (m.p.h.)	Resultant wind: Direction	Speed (m.p.h.)
01	4	29.50	58	55	83	52	5.7	22	3.3
04	5	29.50	57	54	85	52	6.1	21	3.9
07	7	29.52	58	55	83	53	6.4	22	4.2
10	7	29.53	67	59	63	53	9.9	25	4.7
13	8	29.50	71	60	54	52	11.0	27	5.1
16	6	29.48	71	60	54	52	10.4	28	4.7
19	6	29.49	64	58	69	53	7.2	23	1.6
22	5	29.51	60	56	78	53	6.4	22	2.7

USCOMM—ESSA—ASHEVILLE 350

OBSERVATIONS AT 3-HOUR INTERVALS

Day	Hour	Sky cover (tenths)	Ceiling (hundreds of ft)	Visibility (miles)	Weather	Air temp	Wet bulb temp	Relative humidity %	Dew point	Wind direction	Wind speed
01	01	0	UNL	6	H	73	67	71	63	21	6
01	04	0	UNL	5	H	70	66	81	64	21	6
01	07	0	UNL	2	H	71	67	81	65	21	5
01	10	0	UNL	3	H	82	72	61	67	27	12
01	13	3	UNL	3	H	88	72	50	65	28	9
01	16	10	100	4	H	86	69	42	60	24	8
01	19	10	90	3	H	79	70	62	65	29	5
01	22	10	60	3	H	75	68	71	65	23	5
02	01	10	9	3	H	70	67	87	66	36	6
02	04	10	11	8		71	66	84	66	06	8
02	07	10	11	8		70	66	81	64	09	7
02	10	10	17	15		71	65	73	62	04	7
02	13	10	19	15		73	66	69	62	04	7
02	16	10	55	15		74	65	66	60	05	5
02	19	9	CIR	15		69	62	66	57	09	5
02	22	9	CIR	15		66	61	76	58	07	3
03	01	4	UNL	15		62	58	81	56	07	5
03	04	0	UNL	12		56	55	96	55	00	0
03	07	7	CIR	5	H	58	57	93	56	23	2
03	10	10	50	7		72	65	68	61	35	2
03	13	5	UNL	7		79	68	56	62	36	8
03	16	0	UNL	7		77	66	56	60	01	9
03	19	2	UNL	7		70	64	73	61	07	4
03	22	10	CIR	8		68	65	84	63	36	3
04	01	0	UNL	6	H	63	62	93	61	25	3
04	04	6	UNL	0	2 F	60	60	100	60	00	0
04	07	10	3	1	8 F	62	61	97	61	23	3
04	10	10	17	6	H	74	67	69	63	12	6
04	13	10	33	6	H	80	67	51	60	08	5
04	16	8	UNL	5	H	78	69	64	65	04	8
04	19	7	CIR	4	H	72	66	71	62	07	8
04	22	8	CIR	7		69	65	79	62	13	4
05	01	3	UNL	6	GF	65	62	87	61	07	6
05	04	2	UNL	6	GF	66	63	87	62	12	6
05	07	8	60	5	H	70	66	81	64	14	6
05	10	8	UNL	5	H	80	71	62	66	19	7
05	13	10	33	6	H	86	72	50	65	20	10
05	16	10	CIR	5	H	84	71	53	65	21	11
05	19	10	50	6	H	79	70	62	65	21	5
05	22	10	90	8		74	69	79	67	21	8
06	01	5	80	10		73	70	84	68	21	8
06	04	3	80	10		72	68	88	66	23	7
06	07	10	28	5	H	73	69	82	67	21	[illegible]
06	10	8	70	4	RWH	74	71	87	70	24	[illegible]
06	13	9	25	6	H	83	73	63	69	25	[illegible]
06	16	2	UNL	6	H	84	72	57	67	27	15
06	19	2	UNL	5	H	75	70	76	67	23	7
06	22	7	CIR	6	H	73	69	82	67	23	7
07	01	7	CIR	6	H	72	69	84	67	21	7
07	04	10	28	4	H	71	68	84	66	21	9
07	07	7	CIR	4	H	73	69	82	67	21	7
07	10	10	28	5	H	75	72	85	70	25	7
07	13	10	25	4	H	79	71	67	67	28	12
07	16	10	90	6	H	79	70	65	66	27	7
07	19	10	35	10		73	66	69	62	29	5
07	22	10	90	12		67	63	81	61	31	3
08	01	3	UNL	12		65	62	87	61	23	3
08	04	3	UNL	12		63	61	90	60	29	3
08	07	8	25	15		63	60	84	58	28	4
08	10	7	100	15		72	62	57	56	30	9
08	13	8	38	15		74	62	50	54	30	9
08	16	2	UNL	15		75	61	45	52	30	6
08	19	8	40	15		64	57	63	51	29	7
08	22	3	UNL	15		56	54	87	52	24	6
09	01	0	UNL	10		54	53	93	52	26	7
09	04	0	UNL	10		50	49	93	48	23	6
09	07	2	UNL	7		54	53	93	52	24	7
09	10	5	UNL	15		65	55	52	47	28	8
09	13	10	38	15		64	56	61	50	27	10
09	16	9	80	15		64	57	65	52	27	8
09	19	10	70	15		59	56	84	54	26	8
09	22	7	46	15		56	52	73	48	30	10
10	01	4	UNL	10		52	47	69	42	27	8
10	04	10	50	10		52	48	77	45	27	8
10	07	1	UNL	15		52	48	74	44	27	8
10	10	6	45	15		61	50	46	40	32	12
10	13	6	40	15		67	53	36	39	29	11
10	16	3	UNL	15		69	53	32	38	27	10
10	19	2	UNL	15		59	52	62	46	25	7
10	22	0	UNL	15		53	49	74	45	26	6
11	01	0	UNL	10		48	46	86	44	24	4
11	04	7	45	10		51	48	80	45	23	6
11	07	9	45	15		52	48	74	44	21	7
11	10	10	CIR	15		67	55	44	44	27	13
11	13	10	45	15	RW	66	57	54	49	24	12
11	16	10	100	15		67	56	51	48	24	15
11	19	10	70	15		61	54	63	48	25	5
11	22	2	UNL	15		58	54	78	51	22	8
12	01	0	UNL	15		52	50	90	49	23	5
12	04	0	UNL	12		54	52	86	50	19	8
12	07	10	65	10		56	52	75	48	22	8
12	10	5	UNL	15		71	59	49	51	25	15
12	13	3	UNL	12		77	61	37	49	25	19
12	16	0	UNL	10		76	59	33	45	24	19
12	19	0	UNL	10		68	57	49	48	23	10
12	22	0	UNL	10		65	58	65	53	22	8
13	01	5	UNL	10		64	57	63	51	22	9
13	04	4	UNL	10		64	58	70	54	25	10
13	07	4	UNL	7		64	60	81	58	26	6
13	10	2	UNL	10		75	66	62	61	25	10
13	13	3	UNL	10		82	68	47	60	26	13
13	16	0	UNL	10		82	68	47	60	29	8
13	19	0	UNL	10		74	62	50	54	23	10
13	22	0	UNL	10		69	62	66	57	25	10
14	01	0	UNL	10		65	61	81	59	22	5
14	04	0	UNL	8		58	56	87	54	23	3
14	07	0	UNL	8		62	58	78	55	22	5
14	10	3	UNL	8		77	65	52	58	22	6
14	13	9	CIR	10		84	66	37	55	20	10
14	16	8	UNL	10		86	67	35	55	23	10
14	19	9	CIR	10		72	65	66	60	09	5
14	22	8	CIR	10		69	63	71	59	20	5
15	01	7	UNL	10		68	62	78	59	19	8
15	04	6	UNL	10		65	61	78	58	22	6
15	07	8	UNL	5	H	65	61	81	59	20	10
15	10	6	120	7		77	63	43	53	24	15
15	13	10	120	7		81	64	38	53	25	11
15	16	2	UNL	7		81	64	38	53	24	13
15	19	10	55	8		72	62	57	56	23	7
15	22	9	55	10		70	63	66	58	23	6
16	01	10	70	10		69	62	66	57	22	9
16	04	7	70	10		68	61	66	56	21	11
16	07	10	38	7		69	61	63	56	19	9
16	10	10	45	5	H	73	64	62	59	23	8
16	13	10	120	6	H	79	66	50	59	22	13
16	16	10	100	6	H	77	65	52	58	23	12
16	19	10	80	7	RW	71	64	66	59	25	8
16	22	10	80	7		68	64	81	62	21	7
17	01	10	46	2	RWGF	65	63	90	62	20	3
17	04	10	17	1	8 RF	64	63	93	62	20	3
17	07	10	6	1	8 RF	65	64	93	63	32	8
17	10	10	8	4	RF	58	56	90	55	03	11
17	13	10	8	6	RF	57	55	90	54	35	7
17	16	10	17	12	R	55	52	83	50	02	6
17	19	10	28	15		55	51	77	48	02	5
17	22	4	UNL	15		53	49	74	45	03	6
18	01	3	UNL	15		49	46	83	44	00	0
18	04	0	UNL	12		45	44	93	43	23	1
18	07	8	35	15		48	46	86	44	23	2
18	10	7	30	15		58	52	67	47	16	3
18	13	6	33	15		61	52	52	43	03	11
18	16	6	35	15		62	52	48	42	34	8
18	19	2	UNL	15		53	48	72	44	12	3
18	22	3	UNL	15		50	47	83	45	00	0
19	01	0	UNL	15		45	44	93	43	20	1
19	04	2	UNL	15		44	43	89	41	00	0
19	07	8	UNL	7		44	43	93	42	18	1
19	10	9	CIR	10		56	49	60	42	10	10
19	13	9	CIR	10		61	50	46	40	05	7
19	16	8	UNL	15		61	50	44	39	01	7
19	19	6	UNL	15		55	49	64	43	06	6
19	22	2	UNL	15		51	47	77	44	08	6
20	01	6	55	15		49	46	80	43	10	3
20	04	0	UNL	15		46	44	89	43	11	5
20	07	0	UNL	10		48	46	86	44	12	5
20	10	6	CIR	10		60	53	62	47	12	7
20	13	9	46	15		67	54	40	42	10	9
20	16	2	UNL	15		68	55	41	43	16	6
20	19	0	UNL	15		59	52	60	45	11	7
20	22	0	UNL	15		54	50	75	46	16	4
21	01	0	UNL	15		49	47	89	46	23	2
21	04	10	45	10		48	47	93	46	20	4
21	07	6	45	7		48	46	89	45	19	3
21	10	0	UNL	10		62	54	60	48	17	7
21	13	4	UNL	10		69	57	46	47	09	6
21	16	0	UNL	12		72	59	46	50	08	7
21	19	0	UNL	15		60	55	72	51	07	7
21	22	0	UNL	15		55	52	83	50	10	5
22	01	0	UNL	15		50	49	93	48	00	0
22	04	0	UNL	7		48	46	89	45	18	3
22	07	0	UNL	10		52	49	80	46	20	4
22	10	0	UNL	10		67	57	55	50	23	7
22	13	0	UNL	10		76	60	37	48	11	5
22	16	0	UNL	12		74	62	48	53	09	10
22	19	0	UNL	15		64	58	68	53	09	4
22	22	0	UNL	15		59	53	67	48	17	4
23	01	0	UNL	15		52	48	77	45	18	3
23	04	0	UNL	15		51	47	77	44	21	6
23	07	2	UNL	10		51	48	80	45	23	4
23	10	3	UNL	10		67	57	55	50	19	8
23	13	8	UNL	10		76	60	39	49	17	7
23	16	10	150	12		74	62	50	54	01	6
23	19	10	90	15		67	60	68	56	17	3
23	22	10	90	15		62	58	81	56	17	4
24	01	8	90	15		64	58	70	54	22	7
24	04	10	CIR	15		61	57	78	54	19	6
24	07	10	15	7		62	59	84	57	19	5
24	10	10	4	1	RF	61	60	93	59	32	8
24	13	10	23	5	RF	61	59	90	58	32	7
24	16	10	4	2	RF	58	57	93	56	34	9
24	19	10	4	1	8 LF	54	53	96	53	33	9
24	22	10	13	4	LF	53	52	93	51	02	7
25	01	10	17	12	L	52	50	86	48	02	6
25	04	10	38	15		52	50	86	48	02	5
25	07	10	15	15		52	49	83	47	03	5
25	10	10	19	15		54	50	75	46	01	8
25	13	10	19	15		54	49	72	45	01	7
25	16	10	38	15		54	49	72	45	36	7
25	19	10	46	15		52	48	77	45	06	5
25	22	10	33	15		52	48	77	45	09	4
26	01	10	23	10		52	49	80	46	09	5
26	04	10	18	10		52	49	83	47	10	3
26	07	10	17	10		52	50	90	49	26	4
26	10	6	70	15		57	52	72	48	23	4
26	13	7	35	15		64	54	52	46	24	2
26	16	6	30	12		63	54	56	[illegible]	04	3
26	19	0	UNL	10		56	52	78	[illegible]	[illegible]	6
26	22	4	UNL	12		54	51	83	49	15	5
27	01	0	UNL	10		52	50	86	48	19	5
27	04	4	UNL	10		54	52	86	50	21	7
27	07	9	95	7		54	52	90	51	22	6
27	10	10	90	15		60	53	63	48	25	10
27	13	9	120	15		62	53	54	45	24	13
27	16	10	100	15		63	56	65	51	22	8
27	19	5	UNL	15		56	52	78	49	21	7
27	22	2	UNL	15		50	48	89	47	24	5
28	01	5	UNL	10		49	48	93	47	23	5
28	04	0	UNL	10		47	45	89	44	23	5
28	07	2	UNL	7		46	45	93	44	24	6
28	10	6	CIR	15		58	51	62	45	29	5
28	13	10	25	15	RW	57	53	75	49	29	10
28	16	8	80	15		59	50	51	41	30	13
28	19	9	50	15		49	47	86	45	26	6
28	22	2	UNL	15		46	44	83	41	29	7
29	01	7	35	15		43	42	89	40	26	5
29	04	10	55	15		46	44	86	42	26	6
29	07	9	33	10		47	45	86	43	26	6
29	10	7	33	15		56	49	60	42	26	10
29	13	6	38	15		60	49	44	38	30	8
29	16	10	100	15		57	50	60	43	34	5
29	19	10	55	15		54	50	75	46	15	4
29	22	10	90	15		52	48	77	45	15	6
30	01	10	80	15		51	47	74	43	18	6
30	04	10	80	15		52	48	74	44	17	6
30	07	10	80	15		55	48	62	42	20	7
30	10	10	70	15		61	52	52	43	18	13
30	13	10	38	15		67	57	53	49	24	17
30	16	8	35	15		67	58	59	52	26	12
30	19	10	45	10		62	56	70	52	26	10
30	22	3	UNL	10		52	48	77	45	23	5

NOTES

CEILING COLUMN

UNL indicates an unlimited ceiling.
CIR indicates a cirriform cloud ceiling of unknown height.

WEATHER COLUMN

*	Tornado
T	Thunderstorm
Q	Squall
R	Rain
RW	Rain showers
ZR	Freezing rain
L	Drizzle
ZL	Freezing drizzle
S	Snow
SP	Snow pellets
IC	Ice crystals
SW	Snow showers
SG	Snow grains
E	Sleet
A	Hail
AP	Small hail
F	Fog
IF	Ice fog
GF	Ground fog
BD	Blowing dust
BN	Blowing sand
BS	Blowing snow
BY	Blowing spray
K	Smoke
H	Haze
D	Dust

WIND COLUMNS

Directions are those from which the wind blows, indicated in tens of degrees from true North, i. e., 09 for East, 18 for South, 27 for West. Entry of 00 in the direction column indicates calm.

Speed is expressed in knots, multiply by 1.15 to convert to miles per hour.

ADDITIONAL DATA
Other observational data contained in records on file can be furnished at cost via microfilm or microfiche copies of the original records. Inquiries as to availability and costs should be addressed to Director, National Weather Records Center, Federal Building, Asheville, N. C. 28801

STATION: ROCHESTER N Y   YEAR & MONTH: 69 09

References

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